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INVESTIGATION OF CONCENTRATION OF ECONOMIC POWER

HEARINGS

BEFORE THE

TEMPORARY NATIONAL ECONOMIC COMMITTEE CONGRESS OF THE UNITED STATES

SEVENTY-SIXTH CONGRESS

FIRST SESSION

PURSUANT TO

Public Resolution No. 113

(Seventy-fifth Congress)

AUTHORIZING AND DIRECTING A SELECT COMMITTEE TO
MAKE A FULL AND COMPLETE STUDY AND INVESTIGA-
TION WITH RESPECT TO THE CONCENTRATION OF
ECONOMIC POWER IN, AND FINANCIAL CONTROL
OVER, PRODUCTION AND DISTRIBUTION OF
GOODS AND SERVICES

PART 3

PATENTS

PROPOSALS FOR CHANGES IN LAW AND PROCEDURE

JANUARY 16, 17, 18, 19, AND 20, 1939

Printed for the use of the Temporary National Economic Committee *



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(Created pursuant to Public Res. 113, 75th Cong.)

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*Alternates.

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INVESTIGATION OF CONCENTRATION OF ECONOMIC POWER

MONDAY, JANUARY 16, 1939

UNITED STATES SENATE,
TEMPORARY NATIONAL ECONOMIC COMMITTEE,
Washington, D. C.

The Temporary National Economic Committee met pursuant to adjournment on Friday, December 16, 1938, at 10:30 a. m. in the Caucus room of the Senate Office Building, Senator Joseph C. O'Mahoney presiding.

Present: Senators O'Mahoney (chairman) and King; Representative Williams; Messrs. Henderson, Ferguson, Lubin, Patterson, Davis, Peoples, and Thorp.

Present also: Senator Homer T. Bone, of Washington, chairman of the Senate Patents Committee; Representative William I. Sirovich, of New York, chairman of the House Patents Committee. Counsel: Justin W. Macklin, First Assistant Commissioner of Patents; Henry Van Arsdale, Assistant Commissioner of Patents; Leslie Frazer, Assistant Commissioner of Patents; John A. Dienner, special counsel for committee; George Ramsey, of New York, assistant to Mr. Dienner; R. F. Whitehead, Solicitor for the Patent Office; and Grattan Kerans, Administrative Assistant to the Commissioner.

The CHAIRMAN. The committee will please come to order. Vice Chairman Sumners is detained by reason of a caucus of some kind in the House of Representatives.

The Chair will recognize Admiral Peoples, representing the Treasury Department upon the committee.

Mr. PEOPLES. Members of the committee. It becomes my sad duty to announce the sudden and untimely death of Mr. Herman Oliphant, who was a member of this committee. He was a man of the highest integrity, of unbounded energy and devotion to duty, and of unrivaled attainments in his chosen field. At the time of his death he played a truly indispensable part in carrying out the work of this Government and his passing causes irreparable loss to this committee and to the Nation.

Perhaps because he rose from humble beginnings he never disassociated himself and his ideas from the common people. Endowed with unusual vision and mental gifts of the very highest order, he devoted himself unstintingly to the public good without thought of personal gain or of the effect of his ceaseless labors upon his physical well-being.

Here is a man of whom it can truly be said that he gave his life in the service of his country.

It is with a sense of deep personal loss that I speak briefly of Mr. Oliphant's passing, for all those who worked with him had real admiration and real affection for him as a man, and I offer, Mr. Chairman, the following resolution, and move its adoption by the committee:

Be it resolved by the Temporary National Economic Committee in meeting assembled, That the committee has learned with profound sorrow and deep regret of the announcement of the death of Mr. Herman Oliphant, a member of this committee, and that the committee deplores his untimely passing; and be it further

Resolved, That the record of these proceedings be prepared and transmitted to the family of our deceased member.

Senator KING. Mr. Chairman, I second the motion.

The CHAIRMAN. You have heard the resolution. The motion is made and seconded that the resolution as presented by Admiral Peoples, alternate of Mr. Oliphant upon this committee, representing the Treasury Department, be adopted. All in favor will indicate by rising.

It is unanimously adopted.

The CHAIRMAN. The Chairman now takes the opportunity of welcoming to membership upon this committee the Honorable Clyde Williams of the House of Representatives from the State of Missouri, who has been appointed by the Speaker of the House of Representatives to take the place made vacant by the resignation of Congressman Eicher, recently appointed to the Securities and Exchange Commission.

Congressman Williams, we are glad to have you with us, and we are sure that your presence is going to help us struggle along with this problem.

Congressman WILLIAMS. Thank you. I am glad to be with you.

The CHAIRMAN. The committee has been called this afternoon in pursuance of the decision reached at the last public hearing for the purpose of presenting additional testimony with respect to patents. This hearing is under the direction of the Department of Commerce. The Chair will recognize Secretary Patterson to open the hearing.

EXAMINATION OF THE PATENT LAWS AND OPERATION OF INDUSTRY UNDER THEM

Mr. PATTERSON. Mr. Chairman and members of the committee: From December 5 to December 16, 1938, the Department of Justice presented evidence before this body concerning the patent experience of two major industries.¹ At that time, according to the statement of the Department of Justice, interest was centered upon the question of "the relationship between patent practices and the free and open market which it is the purpose of the antitrust laws to maintain." This earlier hearing was "not concerned with the patent law as such or with the details of its administration." To be sure significant evidence was introduced with regard to certain practices in connection with the administration of the patent law, but this was an incidental byproduct of the basic inquiry.

The discussion of the patent laws is resumed today from a somewhat different angle. We are concerned primarily with such questions as: What is a good patent law; does the present law fulfill its constitutional purpose; and, in the light of our modern business

¹ See Hearings, Part II.

structure, do any changes need to be made in its substantive or procedural provisions with a view to its improvement?

The patent system has its basis in the Constitution. The Department of Commerce through the Patent Office is the administrative agency in the Government to which has been delegated responsibility for the proper issuance of patents. Our interest, however, goes far beyond mere matters of procedure. We believe in the importance of invention—that the “progress of science and useful arts” is one of, if not the most important dynamic element in our national economic advance. In the long run, new processes and new products offer our greatest hope for progressive rise in the standard of living and for increased opportunities of leisure time. We believe that an effective patent system is an important factor in fostering invention and furthermore in bringing about the partnership of new ideas and speculative capital, which is so necessary to make the discovery bear fruit.

While we thus unhesitatingly accept the basic concept of a patent system, we are greatly concerned with the problem of making it reach its maximum social value. We must prevent, as far as possible, abuses of any kind which may creep into its operation or which may be committed under the guise of the patent right. During recent years we have tried to deal with these situations by improving and strengthening the administrative process. However, we now believe that some of the difficulties can only be met by legislative action.

The basic purpose of the system was declared in the Constitution:

To promote the progress of science and useful arts, by securing for limited times to authors and inventors the exclusive right to their respective writings and discoveries.

In judging its operation and any proposed changes, these fundamental terms must be kept always in mind.

Our purpose in this hearing is twofold. First, we wish to present to you the experience of the Patent Office, pointing out certain conditions and problems which have directly emerged from its operations. Second, we hope to picture for you certain aspects of the patent system at work. For this purpose we have arranged for several witnesses to appear, typical of successful, independent inventors who have controlled the manufacture of their products, independent inventors who have turned over the results of their invention to other enterprises for exploitation, and inventors who function in research groups attached to large corporations. We shall present several businessmen who have had significant experience with the patent system, and one or two other witnesses whose general knowledge and experience in this subject should be helpful to the committee.

May I emphasize that this is not a completed report. At certain points it will not even be a rounded or completely balanced presentation of a given problem. We do feel that the evidence to be introduced is pertinent to any consideration of changes in the patent law, some of which will be suggested by the testimony of the Commissioner of patents. Perhaps the committee may feel that certain of the conditions or problems discussed should be subjected to further examination and research. I can assure you that the Department of Commerce stands ready to pursue any problem as far as the committee feels it to be important.

The first witness whom I wish to introduce is Mr. Conway P. Coe, Commissioner of Patents since 1933. Commissioner Coe has a wide range of subject matter which he wishes to cover and I hope that it will be possible for him to present his evidence with a minimum of interruption at this session. I am sure that there will be points in his testimony on which the committee may wish to question him in some detail and that we will arrange for him to return to the stand at a later stage in the hearings for as prolonged a discussion of these matters as the committee may wish.

The CHAIRMAN. Thank you, Mr. Secretary.

The chairman desires at this point to make note of the presence here of the Honorable Homer Bone, senior Senator from the State of Washington, who is the chairman of the Senate Committee upon Patents. We feel very grateful that Senator Bone has seen fit to be present at the hearing this morning.

Mr. Coe, are you ready to present your statement?

Mr. COE. Yes, Mr. Chairman.

The CHAIRMAN. Will you be good enough to take the stand? May I say in advance of your beginning to the members of the committee that I understand Mr. Coe has a rather lengthy survey which he desires to enter if possible without interruption. I think it will be a good rule if this afternoon we refrain from interrupting the statement of the Commissioner by questions until he has concluded his prepared statement. If that is agreeable to the committee, Commissioner Coe may proceed.

STATEMENT OF CONWAY P. COE, COMMISSIONER OF PATENTS

Mr. COE. In the last 5 years of my service as Commissioner of Patents I have devoted myself to a careful study of almost every aspect of our patent system. This I have done not merely for my own information but with the purpose of increasing the usefulness of the system to the American people. In the course of this long and serious study I have utilized every available source of information. I have had correspondence and conferences with many persons familiar with the system; with its critics as well as its champions. I have discussed it with inventors; with representatives of every class of industrial organizations; with little men and magnates of business; with patent lawyers and Federal judges; with officials of different executive departments of the Government, and with Members of Congress. My investigations have extended even beyond our own shores. I have had the benefit of the knowledge, experience, and judgment of the officials of various foreign countries, including those of leading industrial nations such as England, Germany, France, Japan, Italy, Canada, and Belgium. I mention these facts only to indicate that my interest in the nature, operation, and effect of the patent system is neither recent nor casual. Let me not be understood as intimating that nothing more can be added to my knowledge, but rather as recognizing the many and difficult problems involved in any attempt at appraising the value of the patent system to our national economy.

At the beginning of my statement I wish also to make so clear as to prevent misunderstanding, first, that I am not only willing but eager to rid our patent system of any and every abuse identified with it, and, secondly, that I shall welcome the adoption of any effectual remedy

Indeed, I am prepared to propose specific improvements before this statement is completed.

For nearly a century and a half the American patent system has had the esteem of our citizens. It has been regarded not merely as a lawful institution, but also as a benefactor to the Nation. I am confident that your committee appreciates the wholesome influence which our patent system has exerted on the economic and social life of the American people. I am quite certain that you wish to preserve all that is good while correcting whatever is evil. For I know that you could not regard as wholly wrong and vicious a system that has brought so many benefits to our people during our entire national existence.

PATENT SYSTEM, BEARING ON EVERY INDUSTRY, AN INTEGRAL PART OF
GOVERNMENT

Mr. COE. It is hardly necessary to tell you that nearly every major industry in the United States and, for that matter, in the civilized world, owes its existence to inventions once protected by patents. However, it may be well to remind, if not to inform, you that American agriculture is indebted to the gin, the reaper, the tractor, and many other machines that facilitate larger production of the crops which our farmers must exchange for their own numerous needs. Communication depends on the telegraph, the telephone and the radio, and other inventions necessary to their successful operation. In the field of chemistry there are vulcanized rubber, celluloid, and bakelite as the expressions of immense investments of money and employment of thousands of workers. Modern transportation, though an industry in itself, depends to some degree on scores of other industries based on patents. In short, every industry in America depends to some degree on others for its operation and all of them are beholden to patents. Every individual in the United States, young or old, rich or poor, is in some form from birth to death, a user and a beneficiary of patents. Indeed, it would be all but impossible for any of us to free ourselves from this daily dependence on patents, for our very escape beyond the confines of civilization would itself require the use of some patented invention.

The American patent system was established at a time when mechanical inventions had already begun to affect not only the industrial conditions, but also the economic, social, and political status of Europe and the new Nation just erected on this continent. The significance of the inventions put to work in England and the States of the Confederation was realized by the American statesmen of that era. It is agreed that their recognition of the value of these new economic factors prompted them to write into the Constitution the provision of article I, section 8, empowering Congress "to promote the progress of science and useful arts by securing for limited times to authors and inventors the *exclusive* right to their respective writings and discoveries." This provision, by the way, is impressive not only because it is included in the Constitution as one of the major grants of power to Congress, but equally because it bestows on patentees a complete monopoly, and therefore raises a question as to the constitutionality of an attempt to compel the owner of a patent to share with others the title, use, and avail of his property.

I do not presume to determine the point; but I must contemplate it as an issue to be met here or hereafter.

The authors of our patent system, judging by the language of article I, section 8, held the *exclusiveness* of the rights vested in a patentee as a powerful aid to progress in arts and sciences. No American among his contemporaries or his successors has achieved a greater reputation as an opponent of monopoly than Thomas Jefferson. Yet he not merely sanctioned, he eloquently advocated the form of monopoly represented in patents. I cite his commentary on an early act of Congress, presumably that of 1790, in the administration of which he collaborated with Henry Knox, Secretary of War, and Edmund Randolph, Attorney General.

An act of Congress authorizing the issue of patents for new discoveries has given a spring to invention beyond my conception. Being an instrument of granting the patents, I am acquainted with their discoveries.

Please, Mr. Chairman, note how ancient is this criticism.

Many of them, indeed, are trifling, but there are some of great consequence which have been proved of practice, and others which, if they stand in the same proof, will produce great effect.

In the arts, and especially in the mechanical arts, many ingenious improvements are made in consequence of the patent-right giving *exclusive* use of them for 14 years.

Certainly an inventor ought to be allowed a right to the benefit of his invention for some certain time. Nobody wishes more than I do that ingenuity should receive liberal encouragement.

That is the end of the quotation from the Jefferson statement.

MONOPOLY OF PATENT A BENEFIT NOT IN CONFLICT WITH ANTI-TRUST LAWS

Mr. COE. It occurs to me that a great deal of misapprehension results from the failure to distinguish between the monopoly or privilege vested in a patentee and the sort of monopoly that British sovereigns once conferred. It is only when we appreciate this distinction that we can understand how Jefferson could consistently advocate the monopoly of patents for inventions while condemning the traditional form of monopoly.

Americans generally detest monopoly in the true sense of the term because it makes possible the ruthless exercise of power. Indeed, the American Revolution was precipitated by popular resentment of the monopoly on tea held by the East India Co. It would, therefore, have been exceedingly strange if, only a few years later, the delegates sent to the Constitutional Convention by Massachusetts and the other Colonies had been willing to sanction an equivalent form of monopoly under the new government they were creating. In the sixteenth and seventeenth centuries a king or queen of England could reward a favorite by granting him a monopoly on salt or some other necessary of life. This beneficiary of royal favor was not, of course, the discoverer of salt. That came ready-made from the hands of the Creator eons before the advent of man. What the darling of his or her majesty received was the power to compel others to use salt solely of his supplying and only on terms of his dictation.

But a patent is no such monopoly. It is a reward for the invention or discovery of something new, something before unknown, something added to the sum total of human knowledge, utility, well-being;

something which the inventor or discoverer, despising the lure of money or fame, might have withheld from his fellow men. By the monopoly that goes with a patent, then, the Government recompenses and, for a limited time, protects the inventor or discoverer who gives to the world the use and benefit of his invention or discovery. This is a kind and a degree of mutuality that negatives monopoly in the old or the current concept. Monopoly in the latter sense of the term gave to an individual or a group complete dominion of something already existent. A patent awards monopoly to the producer of something original, something superadded to the common store. So it is that two things bearing the same name need not be of the same nature.

It has been contended that there sometimes occurs a clash between the antitrust laws and the patent statutes. I might suggest that since the first antitrust legislation in 1890, the patent laws and the antitrust laws have coexisted without any irreconcilable conflicts between them. They have each of them at least one common objective, namely, the retention by the public of a right once acquired by it. As a matter of fact, patents accomplish more than the retention of the acquired rights. Their influence is creative; they operate to multiply and expand acquisitions by the public.

INDUSTRIAL DEVELOPMENT UNDER THE PATENT SYSTEM

Mr. COE. Naturally, there will be differences of opinion as to the influence of the patent system upon our industrial development from the beginning of our Nation down to the present. There are some who will continue to assert that science would have progressed as steadily and that our industrial advancement would have been just as rapid without the patent laws. On the other hand, there are those who, with equal sincerity and far greater logic, insist that the industrial supremacy enjoyed by the United States today is attributable to the liberality of our patent laws. It must be admitted that inventions were few in the centuries between the first recordings of history and the sixteenth and seventeenth centuries of our own era. I cannot dogmatically declare that civilized mankind's inventiveness and progress have come because of the institution of patents, but I can, and do, assert with emphatic positiveness that most of our indispensable inventions and much of our material progress have come since the establishment of patent systems.

It is strange, but no less true, that citizens of other nations, perhaps because of their remoteness, can appraise our institutions better than we can. One of the foreign visitors attracted to the Centennial Exposition held in Philadelphia in 1876 was a Mr. Bally, a Swiss manufacturer. At that period Switzerland was a comparatively industrial nation, having world-wide recognition as a producer of watches and other manufactures but did not yet possess a patent system of any description. On his return to his own country, Mr. Bally addressed his fellow industrialists, presumably an early counterpart of our National Association of Manufacturers. In that address he extolled the American patent system and urged its emulation by the Swiss Government. He testified to what he described as "the zeal and activity of Americans" but recognized also the importance of their patent system as an aid to their industrial progress and a help to

their successful competition with Europeans. He gave examples of the success of American rivalry with the older industrial countries of Europe, and said:

I am satisfied from my knowledge that no people has made, in so short a time, so many useful inventions as the American, and if today machinery apparently does all the work, it nevertheless, by no means, reduces the workman to a machine. He uses it as a machine, it is true, but he is always thinking about some improvement to introduce into it; and often his thoughts lead to fine inventions or useful improvements.

Switzerland, with all its celebrity in the manufacture of watches, had experienced the effect of this American competition. Many Swiss makers of watches had been obliged to reduce their production or even cease manufacture. Then he declared:

We must introduce the patent system. America has shown us how. May our sister republic serve as our model in this.

The Swiss people responded to his appeal by establishing a patent system in 1888.

Among the patents granted prior to 1877 were some covering inventions that have put mankind under lasting obligation to their authors. Their influence and benefits are still among our heritages. Because these classic patents serve to remind us of our indebtedness not only to the inventors who received them but to the system which encouraged them, and because they afford a text for certain statistical studies that have been made for the benefit of your committee, I shall now present drawings and descriptions of some of these basic inventions.

On the right-hand side of each chart we have listed some facts about the industries which have developed from the basic inventions. In some cases the inventors first sold them to manufacturing corporations, and in other instances to service activities. The data represent estimates based on available statistics, but since the ramifications of most of the inventions are inextricably woven into the whole industrial fabric, a segregation of the economic magnitude of any one is extremely difficult to set forth.

I shall not discuss these charts in detail, individually, as I think they are self-explanatory and, Mr. Chairman, I would like to introduce them as a group and to refer specifically to only two of these charts, namely, the patent to Bell and the Goodyear patent.

(The charts referred to were marked "Exhibits Nos. 163 to 178" and are included in the appendix on pp. 1107-1122.)

Mr. COE. I refer to the Bell patent for two reasons, first of all to call your attention to the extreme simplicity and crudeness of it.

The CHAIRMAN. To what chart are you referring now?

Mr. COE. To the chart¹ illustrating the Bell patent, and I refer to that specifically in order to call your attention to the crude character and simplicity of a so-called basic invention and to show you the many refinements that are necessary to convert a basic invention into a commercial enterprise.

The second thing about the Bell chart I wish to mention is its extreme simplicity and almost triviality. If the Patent Office at that time had adopted that high standard of invention which excludes all things trivial, it would probably have refused the patent to Bell, since in its basic characteristics it is hardly more than a toy which would fail to amuse a very young child.

¹ "Exhibit No. 170," appendix, p. 1114.

On the occasion of the centennial of the patent system in 1891, its effects and benefits were made the subject of an address by Carroll T. Wright, the first United States Commissioner of Labor. Mr. Wright was a competent witness. Before entering the Federal service he had been commissioner of labor of Massachusetts. He had given many years to observation and study of our industrial economy. He was old enough to have seen the rise of some of our chief industries from inventions. One such case was the vulcanization of rubber by Goodyear, to whose patent I have just referred, which is shown in the next chart.¹

After that Commissioner Wright declared:

The inventions of Goodyear, whereby rubber gum could be so treated as to be made into articles of wearing apparel have resulted in the establishment of great industries as new creations. We need not in this place consider the great benefits through the use of water-proof clothing. The mere fact that great industries have arisen where none existed before is sufficient for our purpose.

How much more would Commissioner Wright have been amazed could he have looked but 15 years into the future and beheld the vast importance of the rubber industry, representing as it did a tremendous investment of capital and a source of employment for many thousands. He would have been doubly amazed had he been able to witness that industry today.

Doubtless some of the ancient civilizations, such as those of Egypt, Assyria, and China, produced many useful inventions, capable of higher development and wider adaptation, but these were lost to them and remain unknown to us precisely because these people had no arrangement or practice such as we have in our patent system for perpetuating, improving, and supplementing the discoveries of each succeeding generation, thereby assuring the growth and synthesis of the arts, sciences, and mechanics. Our system has preserved the earliest of the inventions made by our own people and those of other lands; it has kept what is old that this might inspire the new; it has established a treasury on which the world may make drafts for what remains useful long after it has ceased to be novel. In other words our Patent Office is a sort of a national suggestion box to which inventors and manufacturers have recourse when they are seeking ideas capable of solving their particular problems. And it is daily serving this very purpose. Some hundreds of inventors, representatives of industry, and scientists resort to its records every day.

The CHAIRMAN. Will you pardon me for interrupting to make note of the presence here of Congressman Sirovich who is chairman of the House Committee on Patents and who has just arrived to listen to your discussion? I would like to have the records show that we have present now the chairman of the Committee on Patents of both the Senate and the House.

RATE OF FILING OF PATENT APPLICATIONS

Mr. COE. The mere statement that the United States has granted more than 2,000,000 patents prompts not merely curiosity but even concern as to their incidence on our national economy. We are moved to ask many questions respecting them. What manner of men are our inventors? Are they relatively more or less numerous

¹ "Exhibit No. 166," appendix, p. 1110.

now than formerly? What becomes of their inventions; that is, where is lodged the ownership of these? Is control of the majority of patents acquired by our great corporations? Have foreign interests become possessed of large numbers of patents essential to American industry?

The facts for which these inquiries call are graphically presented in several charts I have caused to be prepared.

The next shows the number of applications filed and the patents issued from 1836 to 1937.

(The chart referred to was marked "Exhibit No. 179" and is included in the appendix on p. 1123.)

Mr. COE. The chart also indicates the time of certain events which affect the filing of applications, such as the Civil War, the Spanish-American War, the World War, the recent depression, and the fee increase in the Patent Office.

You see that this chart indicates that in 1929 the all-time peak of 94,738 applications of all descriptions were filed. "Exhibit No. 179" includes applications on designs and reissues. This was necessary because in the early records of our Patent Office there was no separation or division between the several types of applications.

This chart is an enlargement of the latter part of exhibit No. 179 and is limited only to applications and patents on mechanical inventions.

(The chart referred to was marked "Exhibit No. 180" and is included in the appendix on p. 1123.)

Mr. COE. This chart indicates that in 1937 we received 65,000 applications and issued 37,700 patents.

The next chart is a diagram showing the number of applications filed and the patents issued for each 10,000 residents of the United States for each of the census years 1840 to 1930.

(The chart referred to was marked "Exhibit No. 181" and is included in the appendix on p. 1124.)

Mr. COE. As you will see, in the ratio of applications to general population, there has been a decline since about 1920 as well as in the number of patents issued, but you might well ask—you might well state or conclude that since in comparatively recent years we have turned out more graduates from our engineering schools and colleges perhaps our inventions are coming from that source more now than formerly.

The next exhibit is similar to "Exhibit No. 181", but shows the ratio of applications filed and patents issued for each 100 technological workers, and the same result is shown on this chart, namely, that there has been a decline in the number of inventions per technological worker since about 1870, and that in 1930 we were issuing about three patents for each technological worker.

(The chart referred to was marked "Exhibit No. 182" and is included in the appendix on p. 1124.)

Dr. LUBIN. May I ask how you define a technological worker? Just whom are you referring to?

Mr. COE. We have included in that all—I think I have the statistics here—all designers, draftsmen, professional inventors, electricians, engineers (civil, mechanical, and electrical), surveyors, chemists, metallurgists; all workers engaged in mechanical pursuits, such as machine operators, foremen, repairmen, plumbers, contractors, masons—not including general office workers.

These two charts generally indicate, therefore, that as a Nation whether you consider it from the standpoint of our entire population or from our technological workers, we are not increasing in our inventiveness per capita.

The next few charts will indicate the distribution of unexpired patents, beginning with the year 1921.

DISTRIBUTION OF OWNERSHIP OF PATENTS

Mr. COE. Here is a graph of the percentage of patents issued to large corporations as compared with all patents issued during the last 17 years.

(The chart referred to was marked "Exhibit No. 183" and is included in the appendix on p. 1125.)

Mr. COE. The definition of a large corporation, as used in this chart, is one having total assets of \$50,000,000 or over. The patents of subsidiaries are included. This chart indicates that as of 1938 we were issuing—that is not the total ownership—but the Patent Office issued 17.2 percent of all patents to corporations having assets of over \$50,000,000, whereas 82.8 percent were issued to individuals, small corporations and foreign corporations.

This next exhibit is similar to "Exhibit No. 183," except that the distribution of patents is expressed in terms of numbers instead of in percentages.

(The chart referred to was marked "Exhibit No. 184" and is included in the appendix on p. 1125.)

Mr. COE. The next chart shows the ratio of patents to the total assets of the large corporation.

(The chart referred to was marked "Exhibit No. 185" and is included in the appendix on p. 1126.)

Mr. COE. The chart expresses the number of patents issued per billions of dollars of total assets, therefore, taking only the last black line in 1937 we were issuing 16 patents to large corporations per each billion dollars total assets.

The CHAIRMAN. Will you state that again, Mr. Commissioner, please?

Mr. COE. Yes. In 1937 we issued patents—we issued 16 patents to large corporations per each billion dollars total assets of that corporation.

The CHAIRMAN. This then is a subdivision of the 17.2 percent?

Mr. COE. Percentage compared with the total relation of patents to their total assets.

Dr. LUBIN. Do you have that broken down at all later on?

Mr. COE. Yes, we have—not exactly in this relation, but more specifically.

Dr. LUBIN. What I am trying to get at is this: The A. & P. stores would probably be among the \$50,000,000 and over corporations. You wouldn't expect them to have any patents. Consequently, if you add them to this group and give a figure of patents issued per billion dollars of total assets, I don't know if it would mean much, would it?

Mr. COE. Of course we have included in this only the patent taking corporations, not the service corporations.

DR. LUBIN. I mean A & P may have just one patent or two in all their history; they don't need them; we don't expect them to take out patents.

MR. COE. If they took out patents they are in; if they didn't, if it is purely a service corporation, they would not be.

DR. LUBIN. So the figure per billion dollars' worth of assets wouldn't be as much.

MR. COE. Not as much as some of the others.

Here is a chart showing the allocation of patents to large corporations, small corporations, foreign corporations, and individuals.

(The chart referred to was marked "Exhibit No. 186" and is included in the appendix on p. 1126.)

MR. COE. A previous chart contained this blue section which shows patents issued to large corporations having more than \$50,000,000. The yellow portion of the chart indicates the proportion of patents that have been issued by the Patent Office to small corporations, that is corporations having anything less than \$50,000,000 assets. The red part indicates the patents issued to foreign corporations, and the white part above it, to individuals.

The next chart is identical with "Exhibit No. 186" except that the distribution of patents among the groups is in terms of percentages.

(The chart referred to was marked "Exhibit No. 187" and is included in the appendix on p. 1127.)

MR. COE. Large corporations, 17.2 percent; small corporations, 34.5 percent; foreign corporations, 5.4 percent; and to individuals 42.9 percent.

I indicated that the previous charts were limited to the number of patents issued to these various groups, and you might well ask, "Well, how would those proportions be changed if you included those acquired by purchase, and, therefore, the total ownership?" This chart is an answer to that: Patents issued to individuals and subsequently acquired by purchase by corporations during the period January 1931 to June 1938, that is determined by actual count.

(The chart referred to was marked "Exhibit No. 188" and is included in the appendix on p. 1127.)

MR. COE. The total patents issued during that period was 334,970. The large corporations had issued to them 48,427 of that total, whereas they acquired by purchase during that period, 1,124. Small corporations had issued to them 117,101, and they acquired by purchase 7,448. Foreign corporations had issued to them 15,403 of the total, and they acquired by purchase during that period 976. While this chart would give you the exact distribution of patents according to complete ownership, taken out by issue or by purchase, you will see that the "Exhibits Nos. 186 and 187" would not have their course materially affected if they were changed to include the total purchased.

THE CHAIRMAN. Mr. Commissioner, would it be proper to state at this point that while corporations may receive patents they may not apply for them?

MR. COE. Yes, sir; that is entirely right. Under the American patent law and practice, the application must be filed by the individual, and the ownership can only be acquired by a corporation by transfer of title from the inventor.

THE CHAIRMAN. So the significance of "Exhibit No. 188" is that corporations acquire by far the largest percentage of their patents while they are in the application stage.

Mr. COE. Yes, sir.

Before I discuss these next charts, I want to caution against the deduction of broad conclusions from the data given on them. They are intended only to be generalizations; they are not to be taken as representing the relative importance of the several categories of large, small, and individual. For example, those charts that we just saw did not show the allocation of so-called key or basic patents. They did not indicate the relative number of patents exploited by the respective groups. Third, included among the patents owned by individuals in this upper group, 42 percent, are many that are exploited by corporations in which the owners occupy high positions in the companies and simply permit the corporations to exploit their own patents. Fourth, in the individual groups are many patents which are owned by individuals but which are exploited by corporations under various license agreements and contracts. I therefore simply want to warn that while the charts do convey certain information as to distribution of patents in the various groups, you cannot predicate too broad conclusions on them.

Here is a tabulation showing the number of patent-holding corporations in each of the classes, large, foreign, and small, grouped by their estimated holdings on June 30, 1938.

(The chart referred to was marked "Exhibit No. 189" and is included in the appendix on p. 1128.)

Mr. COE. In this chart and the subsequent series of charts the holdings of the subsidiaries are not combined with those of the parent corporations. You will see that there is one corporation in the group having between eight and nine thousand patents, of the large corporations; there is one having between five and six, one between four and five, two between three and four thousand, three between two and three thousand, and seven between one and two thousand, and 435 of the large corporations that is those having total assets of more than \$50,000,000, have less than one thousand patents. In that group we also find one foreign corporation having between two and three thousand patents, two having between one and two thousand. Of the so-called smaller corporations under \$50,000,000, total assets, there are four having between one and two thousand patents, and the vast majority of them having less than one thousand patents.

The next chart is really a break-down of this last line of "Exhibit No. 189" including the corporations owning 1,000 patents or less.

(The chart referred to was marked "Exhibit No. 190" and is included in the appendix on p. 1128.)

Mr. COE. I will not go down through this list of ownership because I think the tabulations are self-explanatory, but I will call your attention to the fact that 338 of the so-called large corporations have less than 100 patents; that of the total foreign corporations, 3,233 foreign corporations, 3,213 have less than 100 patents; that of the small corporations, 17,195 of a total of 17,567 have less than 100 patents.

This chart indicates the number of corporations of each class owning a very small number of patents.

(The chart referred to was marked "Exhibit No. 191" and is included in the appendix on p. 1129.)

Mr. COE. It tabulates those taking out an average of not more than one patent a year. This chart was prepared by an actual count.

Of the large corporations, 181 averaged no more than 1 patent a year. Of the small corporations, 14,855 averaged no more than 1 patent a year; that is 85 percent of the total of small corporations averaged less than 1 patent a year, and 40 percent of the total of large corporations averaged less than 1 patent a year. Of the foreign corporations, 92 percent have taken out in the last 7½ years less than 1 patent a year.

On the Patent Office is imposed the duty of making the initial decision whether a patent shall issue for any new and useful art, machine, manufacture, or composition of matter, or any new and useful improvement.

Some notion of the organization and procedure involved in the determination of patentability will be afforded by the next set of charts and the explanations I shall offer.

This chart does not require any discussion. It is inserted in the record merely to indicate the general organization of the United States Patent Office.

(The chart referred to was marked "Exhibit No. 192" and is included in the appendix on p. 1129.)

PROCEDURE IN EXAMINATION OF PATENT APPLICATIONS

Mr. COE. Here we have an outline of the procedure in obtaining patents, showing the appellate procedure from 65 examining divisions which make the initial decision as to patentability. From an adverse decision there is an appeal to a Board of Appeals of three judges. If the decision of that Board is not satisfactory to an applicant, he may, as he elects, go either to the Court of Customs and Patent Appeals to have the decision reviewed, or he can go under R. S. 4915 and file a suit against the Commissioner of Patents in the district court, and from that court appeal to the Court of Appeals.

(The chart referred to was marked "Exhibit No. 193" and is included in the appendix on p. 1130.)

Mr. COE. This chart is a diagram illustrating the procedure of an examining division of the Patent Office examining the application and searching the prior art preliminary to the initial decision as to the granting of a patent.

(The chart referred to was marked "Exhibit No. 194" and is included in the appendix on p. 1130.)

Mr. COE. Let us assume, for example, that an application is filed in the Patent Office on an electric light in which the applicant describes in the claim chandelier, bowl support, and reflecting bulb of the character shown at the left. That application would be assigned to one of these 65 divisions, Division 30, which has the subject of illumination. In that division there are a primary examiner and nine assistant examiners, and to each of the assistant examiners are assigned certain of the subclasses in the illumination art. So that to search this invention, the application would first go into Division 30 in the general class of illumination.

The examiner would search the light support, chandelier, and electrical subclasses, 78, 76, and 52. He would come down to subclass 128 which contained a shade or bowl support, because obviously this invention has support for the bowl. So far he hasn't found whether there is anything new or any novelty in the frosted bulb tip,

and that isn't in his division because that is not under the general subject of illumination. He has to go into the class of electric lamps, so he continues his search into Division 54 and class 176 which has many different subclasses, and he finally finds himself in a subclass that is incandescent lamps with reflectors or refractors, and there he would find whether this frosted tip was new or old.

Here is a graphic illustration of the prosecution steps leading to the granting of a patent.

(The chart referred to was marked "Exhibit No. 195" and is included in the appendix on p. 1131.)

Mr. COE. An inventor has invented this lamp you see in the upper left-hand corner. He goes into the Patent Office, as all inventors do, claiming much more than he is entitled to. In this case he claims that he should have a patent on these elements: socket, bulb, reflector, reflector close to the tip of bulb; and a shade. The examiner makes a search on that, in the process I have indicated in "Exhibit No. 194", and he finds a prior patent that has those elements, namely, a socket, a bulb, a reflector, a reflector close to the tip, and a shade (e). So he refuses to grant the patent on the ground that the invention does not disclose any novelty, whereupon the applicant amends his case for the first time to include a spaced screen (f) which he had originally shown but had not yet claimed because that was a little more specific than the protection he wanted to get when he started.

So he amends his case and comes back to the Patent Office and asks for reconsideration in that amended form. The examiner repeats the search I have indicated. He finds that there is no such shade, and he grants the patent then, including in addition to the five elements originally claimed, also the spaced screen (f), and that he did not make a mistake in granting that patent is indicated by the fact that the patent was in suit and has been held valid by the courts.

Senator KING. May I interrupt. He didn't get a patent for the socket, bulb, or reflector?

Mr. COE. No; he did not. In other words, what he got his patent on was all of these in combination, including that, so this was entirely free to the prior art to be used. [Referring to figure in lower left-hand corner of "Exhibit No. 195".] In other words, he wanted to get a patent that would permit him to stop the use of this [referring to figure in lower right-hand corner of exhibit No. 195], but that was old and the Patent Office does not permit to be removed from the public domain something held by it, an illustration of my point that the patent system operates to retain in the hands of the public rights once acquired by it.

Here is a chart indicating the sequence and possible duration of events relating to an invention from conception of the invention to the expiration of the patent, and the extension or duration of the application stage by continuing applications.

(The chart referred to was marked "Exhibit No. 196" and is included in the appendix on p. 1132.)

Mr. COE. Each of these blocks in the upper chart indicates a period of 1 year. The conception takes place at this point. A year after conception the inventor has reduced the invention to practice, that is taken it out of his mind and put it into some form, not a commercially usable form, but he has demonstrated by making a machine that it can be reduced to practice.

Now it takes him a year, we will say, from that time of his first reduction to practice in the development of the commercial form, to where it can be actually put on the market and sold and be of some benefit to the public. The present statutes then give him 2 full years in which to publicly use the invention before the application is filed, and so we have here 4 years that have now elapsed before the application is even brought into the Patent Office.

The next 3 years are taken up in the prosecution of the application. Three years have been generally regarded as a rather liberal period for the prosecution of most patent applications. The prosecution having been concluded and the patent issued at this point, then the patent life runs for 17 years and expires at the right-hand end of the chart.

I just mention at this point that there you see what is a reasonable, orderly procedure, nothing exciting about it, it is a very common occurrence, but there has been a lapse of 24 years between conception and the expiration of the patent monopoly, and I want to emphasize that point here because in the minds of many men, including myself, from the standpoint of the public this is the most important date in the patent grant, namely the expiration date, because that is the time when the public is invited in to partake of the feast, and up to that time the public has been excluded.

Now the lower half of this chart indicates what may happen to this 3-year reasonable prosecution period arising out of what is known as the filing of divisional applications. Instead of filing at this point in the upper chart (the left end of line) an application on one single invention, the applicant now files an application covering four inventions grouped together in that application. The Patent Office, since it refuses to grant a patent covering more than one invention, requires the applicant to divide out of his original case all of the inventions except one. So he retains in the one patent A, the one invention, and that patent issues at this point, but he has previously filed an application containing inventions B, C, and D. The B patent issues 3 years from that point and he has an application now on inventions C and D. At this stage, 3 years later, the C patent issues and the divisional application on invention D is presented and 3 years later the patent on invention D comes up. That indicates how in the normal procedure of the prosecution of each patent, 3 years having been consumed in each case, by the time D is issued a total of 12 years has elapsed; that is, the enlargement of this period from 3 years to 12, and when the D patent issues, with all the time it was in the Patent Office it had the benefit of this original filing date.

I am not exaggerating the point when I say that this 3 years is frequently exceeded in the prosecution of cases, as is indicated in the next chart which shows that at the present time there are 1,924 applications in the Patent Office more than 5 years old, there are 5,994 cases in the Patent Office 3 to 5 years old, a total of about 8,000 cases today that are more than 3 years old.

(The chart referred to was marked "Exhibit No. 197" and is included in the appendix on p. 1133.)

Senator KING. May I ask one question, please, in violation of the rule? What objection can there be to granting four patents if they are germane or relate one to the other? If one perfects or rounds out the original, then you have B, C, D, and E all relating to A, connected with it and perfecting it. Why can't you consider the four applications and grant four patents simultaneously?

Mr. COE. We do that, Senator, when these other inventions are species of the first invention, but I am speaking now of a case where they are separate and distinct inventions.

Senator KING. No relation to each other.

Mr. COE. They have to stand as separate inventions. They are not simply a species of the broad invention.

The CHAIRMAN. The same question occurred to my mind, and I don't think it is yet answered. Assuming that applications A, B, C, and D, illustrated on "Exhibit No. 196" are all independent devices; is there any reason why you can't issue them contemporaneously to the same person?

Mr. COE. Senator, there are a great many technical and classification difficulties in the way of that.

The CHAIRMAN. But the chart which you have presented to us would carry the inference that if an applicant presented at one time applications for four different patents, he could get only one at a time, and according to your chart the issuance would be spaced over 3-year periods.

Mr. COE. That is only when he comes in and files those inventions in a single application. You see, if he comes in separately, they would all issue probably about the same time.

The CHAIRMAN. Assume that the applicant joins all four separate devices in one application, is there any reason why the Patent Office shouldn't divide them into four separate applications at one and the same time and have them handled contemporaneously and all issued at the end of, say, 3 years?

Mr. COE. There are many reasons why the Patent Office can't do that, Senator. For example, he may not be having claims on all his inventions in there and the Patent Office can't prepare his claims for him. All he has done is shown these various inventions at the time, and therefore he gets the benefit of the filing date. If it were easy for the Patent Office, assuming that it had congressional authority to break down this current application, that might be done, but the applicant has to have the right of claiming his invention and defining the terms in which he asserts his inventorship.

Senator KING. Recurring again, with the permission of the chairman, to the question which I raised, and which the chairman raised, may I invite your attention to "Exhibit No. 195". You alluded to that and mentioned the fact that an application was made for B, though prior to that time the claim had been made for the socket, the bulb, the reflector, the reflector close to the tip of the bulb, the shade, and so forth. Suppose that a person came in and made an application for all of those specific requirements or parts of a finished product, could you not treat that as one application and grant a patent?

Mr. COE. Yes. In other words, that is what was automatically done, Senator. He got his patent on all of those things, but we didn't consider one of those a distinctive invention. You can see how remote some inventions are. Take the automobile. In the same application you could have a method of making a rubber tire, a battery, a horn, all wholly distinct and unrelated inventions that were scattered through the various arts and the various divisions in the Patent Office.

Mr. DAVIS. Commissioner Coe, is it not a fact that a division of an application for patent is frequently required because the different features contained in the application are considered and handled by different divisions in your office?

Mr. COE. Yes, that is one of the criteria as to the classification of inventions, it is one of the tests we put as to whether or not they are separate inventions. That is, if in one division you have a number of applications that have come in directed to one certain invention, that is an indication that the inventors and the art regard that as a separate invention and it is not to be mixed up and confused with a lot of other divisions.

Mr. DAVIS. Instead of directing a division of an application, do you ever have the chiefs of the different classification divisions act cooperatively in considering and deciding upon an application?

Mr. COE. I am not sure I understand your question, Judge, but let me say that this question of division of inventions is not an easy one to decide and the Patent Office is engaged in frequent disputes with an applicant as to whether or not there are two inventions or one, and we have a classification division that decides that question.

Dr. LUBIN. Mr. Coe, may I ask a question? If I get your point, the inventor, should he so desire, could file application for four independent inventions at the same time, four patents, and on that basis you could grant all four at the end of 2 years or as soon as you finished the search and found him entitled to it.

Mr. COE. Yes.

Dr. LUBIN. But in order to prolong the life of that monopoly, he doesn't ask for four separate patents, he asks for one patent which includes those four separate things.

Mr. COE. Yes; one patent on that, frequently knowing that the Patent Office cannot embrace all of that subject matter in one patent. That does have the effect of postponing the date of issue, and, therefore, its expiration.

Doctor, I want to answer your question. I have a few more charts on this thing and maybe some of these questions will clarify themselves.

The CHAIRMAN. I think, if I may be pardoned for violating the rule which I laid down myself, I understand your point now to be this, that an applicant may file with the Patent Office an application which actually contains four different devices, each one of which is patentable. Because of your rule that only one subject will be covered in a patent, you say to the applicant, "We cannot issue you a patent for A, B, C, and D. Choose which one you will have." Thereupon, he makes a choice and he allows the other three to await some future time when he asks for the issuance of a patent upon one of the remaining three, and later on one of the remaining two, and later on on the last one. Is that it?

Mr. COE. Yes; but all the time, Senator, getting the effective date of those cases carried back.

The CHAIRMAN. In other words, the patent monopoly can be extended by the operation of this device which you have illustrated by these charts.

Mr. COE. The divisional and continuation practice is one, and I shall also refer to the interference practice as another.

Senator KING. However, upon the granting of a patent for A, if he had four devices, the statute of limitations or the monopoly granted by the law would terminate at the end of 17 years.

Mr. COE. The patent on A would terminate; yes.

Senator KING. He couldn't prolong the life of A by subsequently or simultaneously filing devices for B, C, and D?

Mr. COE. He doesn't prolong the life of A unless he gets a case where a broad patent issues after a specific patent.

Representative REECE. If I may divert further, when the applicant has filed an application which the Patent Office, upon consideration, decides embodies four patentable ideas rather than one, would it be feasible, do you think, to have the Patent Office vested with authority to decide that the application had been improperly filed, whereupon the applicant would have the right to file new applications embodying each of the separate patentable ideas, the date beginning to run on each one of them from the date of the new filing?

Mr. COE. You mean you would have the effective date of the divisional applications from the filing of the divisional applications, and not carrying back to your original, prior case? Of course, that is what is done, and that is the effect of these divisional cases, that they get the benefit of the early filing date.

The first part of your statement is exactly what the Patent Office does. They say "This is an improperly filed application, and you have to divide these out." If he agrees with us or we have a final decision to that effect to force him to, he then files these divisional applications.

This chart is next.

(The chart referred to was marked "Exhibit No. 198" and is included in the appendix on p. 1133.)

REFORM IN PATENT PROCEDURE SOUGHT

Mr. COE. The upper diagram of this chart is a theoretical situation; the lower diagram suggests a corrective for this situation, which I would like to discuss at a later moment. Similar to "Exhibit No. 196", it indicates the first filing of the four inventions in one application, the issuance of A patent and its expiration, the issuance of B patent, C and D, with D patent expiring out here, 44 years after the first presentation to the Patent Office.

Then, to show that this theoretical explanation is not an impossible thing or something we have just imagined, it is illustrated in the upper section of this chart, based on an actual case in one of the patents, actually of a series of inventions originally filed.

(The chart referred to was marked "Exhibit No. 199" and is included in the appendix on p. 1134.)

Mr. COE. One patent will expire in 1954, 44 years after the date of filing. While I have these charts, and because it will be the subject of later discussion, I might just ask you to let your eyes glance down to the lower half of the chart, which would indicate the effect of a so-called 20-year proposal, which would require all of those patents to expire at the end of 20 years from the date of filing.

Senator KING. Why should not that be done if they relate to the same subject, what the lawyer would call "germane" to the major application?

Mr. COE. There is no reason I know why this should not be done. Which do you mean—this 44-year expiration? The reason that shouldn't be done, in my judgment, is this, that 44 years is projecting the expiration of a patent into the future almost a half century, during which time the art has ordinarily progressed far beyond the value of the patent and the public gets a wholly worthless thing at the time of the expiration.

Senator KING. The point I made is, I do not quite understand the reason why, although you did explain it but I didn't quite get the point, when A was granted, if B, C, and D, were germane, and I use a phrase which you as a lawyer understand—connected with, or a part of or directly related to—it all should not expire contemporaneously.

Mr. COE. There is no reason at all, Senator, why they should not.

Senator KING. Why should they not be granted at the same time? Why should B, C, and D be held in vacuo during that period?

Mr. COE. We do just exactly what you are suggesting except where they are independent inventions, and in that case we haven't the authority to grant a patent covering more than one.

The CHAIRMAN. Let me suggest, Mr. Commissioner, that you give a more detailed explanation of the diagram which appears on the upper part of "Exhibit No. 199". I think that explains rather clearly what you are endeavoring to develop.

Senator KING. Before you do that, if I may be pardoned, why should not the Commissioner, when he filed A, B, C, and D, examine to determine whether they are related, and if he determines that they are not, that B, C, and D are independent, relating to a different invention entirely, why should he not say, "I am going to treat, however, the application of B, C, and D as of this date," and let the statute of limitations, if I may use that term, expire at the end of the 17 years?

Mr. COE. If I understand your question, Senator, that is exactly what we propose in this procedure.

Senator KING. That is satisfactory, but I got the idea that he might determine that B and C and D might be held there in suspense, so that ultimately they might not expire for 44 years.

Mr. COE. No, Senator. If he lets this first patent issue before he files the separate divisional applications then he couldn't get a patent, because it has been disposed of, but in each case he files the divisional application before the issuance, so he has a continuance of pendency of the subject matter before the Patent Office.

Now, in the actual case that we have cited, on the top of "Exhibit No. 199", an application containing four distinct inventions was filed on February 12, 1910. A divisional application dividing the B application was filed in December 1924. The B patent issued in December 1925, and expired at this point here. The A invention was prosecuted 27 years, and issued on March 9, 1937. The C invention was issued in March 1928, and the D patent in January 1931.

In this case it is true that there were many interferences and appeals that accounted for that 27-year prosecution.¹ It was a perfectly normal procedure. I won't criticize it as something that shouldn't have happened, because it is the way the rules are made today. We do think that that is a condition which should be corrected.

Dr. LUBIN. Mr. Coe, on the 20-year basis could those interferences and appeals still be in the picture?

Mr. COE. I am going a little later to discuss the problem. I do not think the 20-year proposal can be applied fairly and equitably with our present interference practice, and therefore there will have to be a concurrent reform of interferences to make way for the fair application of the 20-year proposal.

The CHAIRMAN. Let me say to the members of the committee that the Secretary of Commerce has suggested to me that if we allow the

¹ See review of history of Stelmer patents, Hearings, Part II, pp. 438-440.

Commissioner to take his own time, he will develop the answers to all of these questions. We will try to follow our own rule, Mr. Commissioner.

Mr. CoE. Some of these points I am coming to, but I am not sure I will cover them all, Mr. Chairman.

In that Steimer history, as a part of that 27-year prosecution, there were some interferences. Merely to give you a general idea as to the effect interferences have upon this subject of delay, we have prepared this chart.

(The chart referred to was marked "Exhibit No. 200" and is included in the appendix on p. 1134.)

Mr. CoE. This chart shows that in a total of 2,713 interferences which were decided on evidence in the period 1924 to 1933, the minimum duration of any of those interferences was 5 months, the maximum was 10 years and 9 months, and the average was 2 years and 6 months. I stated that this is a tabulation of interference cases decided on evidence. During that whole period there were a total of 17,162 interferences, but other than the number indicated on the chart they went out on record judgments, concessions, motions and dissolutions and did not go to the testimony stage.

The next chart is somewhat complicated and I do not intend to go into it in detail, but I do want to put it into the record so it will be available for future study.

(The chart referred to was marked "Exhibit No. 201" and is included in the appendix on p. 1135.)

Mr. CoE. The upper graph illustrates a long delayed interference, a prosecution during the interference of 10 years and 9 months. Of that time, 15.3 percent was taken up by the Patent Office; 30.5 percent was taken up by the parties; stipulations consumed 35.9 percent, and appeals to the court 18.3 percent.

To Dr. Lubin I might suggest that if we had the 20-year bill, all that stipulation period would in the main fade out.

The middle graph illustrates successive interferences on a single application, one case being involved in 123 interferences. The lower graph illustrates a complicated series of interferences between several applications.

Finally there comes the litigation of patents. When a patent issues to an inventor we purport to give him the right, the exclusive right, for a term of 17 years to prevent others from making, using, or selling the invention covered by it. But we say that with our tongue in our cheek, for we know better than he that by our present method of adjudicating patent rights he will find it exceedingly difficult to prevent the wrongful appropriation of his property and may be compelled to stand helpless while he is despoiled. As you are aware, if the inventor undertakes to invoke the law for his protection he must file suit in a United States district court. If the decision of that court be objectionable to him or to the other party, the case must be taken to one of the 10 Circuit Courts of Appeals. This in itself is a heavy financial burden, but one which, perhaps most inventors could bear with their own means or the help of others. But having taken this appeal, what has he gained? Hardly more than a ruling as to his rights in that particular circuit. He must then, at least theoretically, go from one to another of all the other circuits, and if perchance from these many litigations there come conflicting decisions.

he has the privilege—if he still has the wherewithal—to carry his case to the United States Supreme Court.

My conviction is that the poor inventor, and through him the public, suffers injustice precisely for the reason and to the extent that the monopoly, the exclusive right, purportedly bestowed on him is not now fully safeguarded. What we need is not to decrease but to enhance the monopoly called a patent. Genuine protection in that form would be the last surviving bulwark standing between the inventor and the onslaught of mighty corporations.

A patent should function as a leveler whereby an individual or a company of small means may be enabled to hold his or its rights of property against the pressure of the strongest adversary. It should have a protective character like that of a high-power rifle in the hands of a puny man beset by a wildly charging bull elephant. Unfortunately, the patent affords no such safeguards. The charts I shall now show to you reveal some of the complexities of our system of adjudicating patents.

Here is a map of the United States.

(The chart referred to was marked "Exhibit No. 202" and is included in the appendix on p. 1136.)

Mr. COE. This map is divided into judicial circuits, showing the number of patents in litigation before the district courts and courts of appeals in each circuit for a 4-year period from 1935 to 1938. By reference to the upper right-hand corner, in the second circuit you will see during that period 1,386 patents were involved in the district court, and within the circle of that circuit, 192 patents went to the court of appeals.

In the tenth circuit, 115 patents were involved in litigation, and within the circle, 18 went to the court of appeals.

The shaded portions of each of the blocks in each circuit, such as the upper shaded portion in the second circuit, indicated by a numeral "270" indicate the number of patents in each circuit which have been adjudicated in at least one other circuit. So, of all the patents indicated in that period, about 20 percent have been adjudicated in more than one circuit.

Here is a case history of the litigation of one patent, showing seven suits filed in four different circuits, and a continuation of litigation after decisions of invalidity by two different courts of appeals.

(The chart referred to was marked "Exhibit No. 203" and is included in the appendix on p. 1136.)

Senator KING. Could you say definitely that the same issues were raised in each case where the validity of the patent was challenged in more than one district?

Mr. COE. I can say that when the validity is challenged there can be only one issue, and that is whether it is a valid patent.

Senator KING: I was wondering if there was any other issue involved.

Mr. COE. I will show you how generally the same result is obtained. In the first suit the patent was held valid and infringed, and defendant took a license. In the second suit the claims were held not infringed, and on appeal the claims were held invalid. There you have a ruling of invalidity by this court of appeals and a ruling of validity by the district court in the same circuit. Certiorari petition was filed and denied by the Supreme Court.

In the third suit, a preliminary injunction was granted. Appeal was dismissed without prejudice on plaintiff's motion.

In the fourth suit, over in the second circuit, the patent was held valid and infringed by the district court; was held invalid on appeal. Certiorari was denied there by the Supreme Court.

Suits 5 and 6 were filed in Ohio, dismissed at plaintiff's request; and suit 7, now out here in the tenth circuit, was filed and claims were held invalid at the trial. I defy anyone to tell the exact status of that patent in the United States today.

The next chart breaks down numerically the number of suits filed and the number of patents involved in both the district and courts of appeal in the fiscal years indicated at the bottom of the chart.

(The chart referred to was marked "Exhibit No. 204" and is included in the appendix on p. 1137.)

PURPOSE OF PATENTS THE ENLISTMENT OF CAPITAL AND LABOR IN NEW ENTERPRISE

Mr. Coe. It is not the principal purpose of the patent laws of our own country or of any nation to reward an individual. The purpose is much deeper and the effect much wider than individual gain. It is the promotion of science and the advancement of the arts looking to the general welfare of the Nation that the patent laws hope to accomplish. The individual reward is only the lure to bring about this much broader objective. Every patent granted benefits society by adding to the sum total of human knowledge, but that is not enough, and that alone will not achieve the ultimate goal of the patent system. An inventor will not be rewarded and society will not be benefited until the invention passes into commercial channels. And it is just at this point that patent protection plays its most essential role, that of transforming the invention from the idea into a commercial enterprise. Unfortunately, this step involves the expenditure of money, and a very peculiar kind of money at that. It is not only necessary that capital be available but that speculative capital shall be available, capital that does not respond to risks and ventures unless there is promise of more than the ordinary Government-bond reward. Dr. Thorp, for example, has pointed out the risks of business and the hazardous character of both new and old enterprises. Capital knew this long before Dr. Thorp called it to our attention.¹ It will know it until the end of time. As Dr. Thorp has indicated, there is nothing quite so risky as a new enterprise and yet it is in just such things that the capital that goes into the commercialization of new inventions must be invested.

Speculative capital must be encouraged to fall in behind a new enterprise and this is true whether the enterprise is wholly new or represents merely an expansion of an established organization. Some testimony has been offered to this committee by representatives of large corporations that they would continue to invent, and invent, and invent, and research, research, and research whether or not they were rewarded by the patent grant, but, if you will investigate, I believe you will find that whenever these large corporations, themselves firmly established, undertake a new development, that development is likely to be founded upon patent protection. Whatever opinions have been expressed to this committee or may hereafter be expressed as to whether or not the inventor will continue to invent

¹ Testimony of Dr. Willard Thorp is included in Hearings, Part I.

without the patent system, I think I can present to you indisputable evidence that speculative capital will not back new inventions without the patent protection. And in the final analysis this is the crux and the most important thing in the whole patent question.

About 8 years ago, the Patent Office started a practice of making applications for patent "special" as a means of inducing the investment of capital and the employment of labor in the commercialization of an invention sought to be patented. In order that the application shall be accorded this special status and thus be expedited, the applicant is required to make oath as to his willingness and ability to comply with three conditions.

He must make oath that—

First. He has sufficient available capital and facilities to manufacture the invention in quantity.

Second. That he will not undertake manufacture unless certain that the patent will issue.

Third. That he obligates himself to manufacture the invention in quantity immediately upon the allowance of claims which will protect the invention.

Under this practice we have during the period from July 1, 1933, to June 30, 1938, made 457 applications special. After the patents have been granted under these circumstances and to determine the good faith of the patentee, it is our practice to call upon him to report under oath at the end of 3 months from the grant of the patent as to the exact amount of capital that has been invested and the increased employment of men resulting. Recently we have caused an analysis to be made of these reports and I think you will find the results interesting. Remember that the figures which I shall cite are only for the first 3 months of the patent life. Obviously, if these reports were continued throughout the full term of the patents, that is 17 years, the showing would be very much more impressive.

I have prepared but will not now repeat a detailed tabulation of the statistics respecting these applications. I shall supply it to the stenographer for inclusion in the record. In the meantime I shall give you only a summary.

Here are the facts as to the 457 cases given special status:

	<i>Patents</i>
Money expended or men employed, or both.....	247
Negative report.....	36
No report.....	62
Total.....	344
Applications abandoned or forfeited.....	61
Applications pending Aug. 25, 1938.....	52
Total made special.....	457

The reports filed indicate the following results:

First 3 months period	Total	Patents re-ported	Average per patent
Sum invested or spent by reason of patents.....	\$8,998,014	247	\$36,429
Additional men employed.....	14,413	167	86
Additional labor hours.....	457,544	16	28,597
Additional wages paid.....	\$113,435	12	\$9,453

The 247 patents prompted a total new investment of \$8,998,014, or an average of \$36,429 per patent. They also conduced to the employment of 14,413 additional persons, an average of 86 per patent. That was done during the first 3 months of the life of those patents.

Mr. Leon Henderson, on his appearance before this committee,¹ visioned what, to me, was a very dismal prospect for the future of our country. This noted economist testified that in 1929 the business index was 120. At the present the business index is 102. He went on to point out that, in order to attain the same status of unemployment we had in 1929 we should need to go about 140 in the index of production maintained by the Federal Reserve Board, because since 1929 the number of those eligible for employment has increased by millions. Is this to be attained? I suppose this is the fundamental question with which this committee is to concern itself and as to which there will be much difference of opinion. There are no new areas in this country available for expanding markets and for development by our people. It is my very firm conviction that among the most promising means of coping with the disturbing conditions described by Mr. Henderson are invention and science, the creation of new industries, and the expansion of our manufacturing facilities. Therefore, those who believe, as I do, that by these means we shall progress and prosper, feel we should spare no effort in encouraging their future development.

The patent system of the United States, more than any other in the world, offers hope, encouragement, opportunity and recompense to an individual or a company of small resources. It is as democratic as the Constitution which begot it. Most foreign patent systems impose discouraging burdens upon the individual. This striking contrast between our patent system and others and a proof of the advantage which is assured to the American inventor or company of limited means will be pictured in the chart you are now to see.

(The chart referred to was marked "Exhibit No. 205" and is included in the appendix on p. 1137.)

Mr. Coe. The diagram in the upper left illustrates the total cost of Government fees for obtaining and retaining a patent throughout its entire life in the United States as compared to France, Great Britain, Italy, and Germany. You will observe that in the United States it costs an inventor \$60 in Government fees to obtain and to maintain his patent rights, that is to keep his patent. Going to the other extreme, in Germany, to obtain and to maintain the patent rights for a period of 18 years it costs the individual inventor \$1,965.

The chart in the lower right illustrates the scale of the fees required in foreign countries to retain ownership of the patents. It starts with the German example in the third year and continues increasingly until the eighteenth year, \$340 approximately.

Remembering that very seldom can an invention be commercialized through one invention and that probably in most cases at least 10 inventions are utilized, you can see that if a small company or an individual attempted to commercialize a product in the United States it would cost him \$600, whereas in Germany it would be \$20,000.

¹ See Hearings, Part I, p. 157, et seq.

SUGGESTIONS FOR CORRECTION OF ABUSES IN PATENT SYSTEM

Mr. COE. Mr. Chairman, I take it for granted that your committee is interested in learning whether in my studies of the patent system and observation of its performance I have detected any abuses or weaknesses requiring correction. My answer is in the affirmative, and I shall briefly outline them to you and offer suggestions for their correction.

You will recall the difficulties faced by an inventor or patent owner in the enforcement of his patent rights as indicated in exhibits Nos. 202 to 204. With these problems and hardships in view, I recommend for your consideration as a major improvement in the patent laws the creation of a single court of patent appeals.

Such a court, having jurisdiction of patent appeals coextensive with the United States and its territories, would operate to reduce the time and cost of litigating questions of ownership, validity, and infringement of patents and obviate conflict of decisions between appellate tribunals. It would, in my judgment, assure to patentees, industry and the users of patented inventions a remedy for some of the most serious evils in the present patent system.

Exhibits Nos. 196, 197, 198, and 199 have illustrated the abuses of the patent monopoly chargeable to long delays in the prosecution of applications in the Patent Office. Any procedure which permits a lapse of 44 years between the filing of an application and the expiration of the resultant patent cannot be tolerated. To correct the abuse of long pendency and to force the early beginning of the monopoly and its correspondingly prompt expiration, I recommend the adoption of the so-called 20-year proposal. This proposal does not increase the present period of the monopoly, which will remain, as now, 17 years. Its purpose is to fix a definite time, calculated from the date of filing, beyond which the monopoly or any of its ramifications cannot continue. Regardless of the length of time consumed in the prosecution of the application, the monopoly must end 20 years after the date of filing.

Three years has generally been regarded as a very liberal allowance of time for prosecuting a patent application. If a law such as that recommended were enacted, a patentee who diligently prosecuted his application and obtained his patent in 3 years would enjoy the full 17-year monopoly. If, however, he delays the prosecution or attempts to keep his case in the Patent Office he will be positively penalized by the shortening of the monopoly. In other words, if he consumes 5 years in the prosecution his monopoly will expire in 15 years after the grant of his patent. If he takes 10 years his monopoly will be reduced to 10 years. Had this limitation been effective at the time of filing the Steimer application, to which reference is made in exhibit No. 199, the patent granted upon it would have expired 22 years earlier than it now will.

It will, of course, be contended that in some cases an applicant will be penalized and have his monopoly reduced by reason of ill-advised actions of the Patent Office and because of delays for which he is in no wise responsible. Admitting this to be a possibility in some cases, I nevertheless feel that the permanent public interest is paramount to the occasional inconvenience of the individual. Accordingly, the 20-year proposal prefers the public interest to the individual interest.

Not all of the delays in the Patent Office are the fault of the applicant and indeed some cannot be avoided. This is especially true when his application becomes involved in an interference instituted for the purpose of determining priority between him and another applicant. There is no question that the interference procedure has been greatly abused and that in some instances it has been invoked for unworthy purposes, as, for example, to delay a competitor's application in the Patent Office. The 20-year proposal could not be applied equitably and fairly along with the present interference practice. It is therefore evident that concurrently with the enactment of the 20-year proposal there must be a radical change in interference procedure. While it is the unanimous opinion of the officials of the Patent Office and virtually the consensus of the patent bar and the public that the interference practice should be reformed, there are many and diverse views as to the best way to accomplish the purpose. Some, for example, would go to the extreme of abolishing interferences entirely and award the patent to the earliest applicant. This would be a harmful practice in my judgment, because it would result in a race of inventors to the Patent Office, bring in a flood of improperly prepared applications, and conduce to fraud.

The CHAIRMAN. Mr. Commissioner, may I interrupt you? For the benefit of the public, which may read the report of your testimony, I suggest that you define here briefly what an interference is. It is a technical word, of course, the meaning of which is well understood to those who practice patent law, but may not be generally understood.

Mr. COE. An interference proceeding is a name given to a proceeding in the Patent Office which is instituted for the purpose of determining as between two or more inventors claiming the same invention, which of those contestants was in fact the first inventor.¹

Senator KING. Calling for an interpretation by the Patent Office.

Mr. COE. Yes, sir. The Patent Office is required, as between these rival claimants for a patent, to determine which one actually made the invention first in point of time, and that man is awarded the patent.

The CHAIRMAN. An interference may be filed only in the Patent Office?

Mr. COE. An interference can be had only in the Patent Office. It is a proceeding which the Patent Office itself initiates. It is sometimes sought when an applicant is aware of the fact that someone else is in the Patent Office with a similar application, and he files an application and demands that it be put into interference with the other party, but on the Patent Office is the final, sole responsibility of declaring that interference.

The CHAIRMAN. Do you wish us to understand that interferences are sometimes filed for the express purpose of delay?

Mr. COE. Yes, there is no question about that.

After years of study, during which I have considered literally thousands of suggestions, the recommendations I am about to propose impress me as the most satisfactory, although I concede that this particular proposal, like many others, will provoke dissent.

At the present time the first decision in an interference proceeding is rendered by a single interference examiner. From his decision an appeal may be taken to the Board of Appeals, and from that tribunal

¹ See also "Exhibits Nos. 200 and 201," appendix, pp. 1134-1135.

to the district courts or the Court of Customs and Patent Appeals, as the applicant may elect. I urge that the interference procedure be terminated with a single decision of the Examiner of Interferences and that a patent be promptly granted on the basis of that decision. This would abolish all appeals to the Board of Appeals within the Patent Office. The prompt issuance of a patent will start the patent monopoly to run and enable the patentee to assess damages against his opponent during subsequent litigation if he should ultimately prevail in the courts.

Since this single decision of the Patent Office would be final, it may be desirable to enlarge the tribunal so that a board of three examiners rather than a single examiner shall have power to decide these contests.

From an adverse decision of the Interference Board appeals would be taken directly to a court which could in a single proceeding review the decision of the Interference Board and, if the facts justified, award the appellant the patent and also cancel the patent already issued on the basis of the Patent Office award. The suggested procedure would minimize the duration of an interference and make it possible to apply the 20-year proposal without unfairness or injustice.

Renewal applications should be abolished. Under the present practice an applicant may prosecute his application to the point of allowance, fail to pay the final fee required by the law, and thereafter renew the application and resume prosecution. This procedure seems to be wholly unnecessary and I recommend its unconditional abolition.

The historic warrant for the renewal procedure was the purpose of affording relief to an applicant who was unable to pay the final fee when this became due. But it is now used frequently by corporations which are quite able to pay the final fee but which resort to the procedure as a device for continuing the prosecution of their cases. As a safeguard for an inventor who is financially unable to pay the final fee within the statutory period, I propose that the Commissioner of Patents, upon proper showing, have authority to receive payment of it at a later date.

Under the present law an inventor may make public use of his invention for 2 years before filing his application. As a further step in accomplishing an earlier filing of the application looking to an earlier issuance of the patent, I propose that this public use period be reduced from 2 years to 1.

The present law allows an applicant 2 years within which to copy claims from an issued patent for the purpose of asserting the priority of his invention. As a parallel to the other steps which have been recommended to rid the patent procedure of this element of elapsed time, I propose that this period of 2 years also be reduced to 1.

Finally, I recommend that the authority of the Commissioner of Patents be enlarged so that in certain circumstances he may require an applicant to respond to an office action within less than the normal statutory period of 6 months. This grant of authority is necessary to the curtailment of the period of pendency of applications. An application may have been prosecuted for 3 years, and all material issues resolved, except for the correction of a slight inaccuracy or the adjustment of a controversy about a minor point. Under such circumstances it is felt that the Commissioner of Patents should be authorized to require an applicant to respond within less than 6 months, and, if it should be felt that the exercise of the power should be restricted, a minimum of 30 days for response may be fixed.

The program which I have outlined has had the deliberate and thorough consideration of the Patent Office Advisory Committee and has been formally recommended to the Secretary of Commerce. While I do not claim that these proposals are a panacea for all of the ills from which the patent system may be suffering, I do feel that they will remove the major abuses of which I am aware and will render the operation of the system more effective for its intended purpose.

Mr. Chairman, by way of valedictory let me say that our patent system has developed in our people a creative faculty that has served other ends than the evolvment of things purely mechanical. That faculty, I believe, has proved signally useful in solving some of the great problems that have arisen in our task of preserving and perpetuating our democratic form of government.

Naturally, among this vast number of more than 2,000,000 patents there are many covering inventions which either have wholly lacked utility or which for other reasons have failed to achieve commercial success. Nevertheless we shall err if we appraise patented inventions merely in terms of utility and success. Their commercial value and their celebrity are not their sole merit. They symbolize a spirit that enriches the world though it fails to recompense the inventor. That spirit is one of patience, resoluteness, sacrifice—suffering, too, if need be—in the pursuit of an ideal. Abraham Lincoln was one of those inventors who failed, if by that we are to understand that his invention brought him neither financial return nor great renown. But I like to think that his was the true inventor's spirit, which moved him to invent a boat designed to carry its burden, including human beings, safely over dangerous shoals. Only a few years later that spirit was to sustain him in guiding the ship of state through a tragic storm.

(Copy of the Lincoln patent referred to was marked "Exhibit No. 205-A" and is included in the appendix on p. 1138.)

Mr. COE. In our estimate of our patent system, then, we cannot disregard its spiritual influence in our national life and destinies.

Mr. Chairman, that concludes my statement.

The CHAIRMAN. Commissioner, we are very much indebted to you for your statement. May I, before you leave the stand, call your attention to "Exhibit No. 186." This chart, as I understand it, was prepared in order to show the number of patents over the period of years extending from 1921 to 1937, issued to large corporations which, as I understood your testimony, includes corporations having assets of \$50,000,000 or more, to small corporations which includes all corporations with assets under \$50,000,000, to foreign corporations and to individuals. It is obvious from the chart that by far the largest number of patents are issued to individuals. This chart takes no account, does it, of the utility of the patents which have been issued?

Mr. COE. No, sir.

The CHAIRMAN. So that while it is true, as shown by one of the earlier charts,¹ that 17.2 percent of all the patents are issued to corporations with assets of \$50,000,000 or more, that does not at all indicate what proportion of the valuable and practical patents are held by these large corporations?

Mr. COE. No, Mr. Chairman. I want to indicate that it is dangerous to draw too broad conclusions from these charts. They are

¹ "Exhibit No. 183", appendix, p. 1125.

generalizations and they do not show the results you inquire about. They don't show the location of so-called key patents, for example.

The CHAIRMAN. I was impressed by your testimony given a little bit later after you had introduced these charts when you were discussing the necessity of protecting the small inventor by giving him—and by the use of the word “small” I really meant the individual inventor—a more certain court of appeals, by reducing the number of courts through which he may be dragged in the prosecution of suit. I was impressed, I say, by your statement, as I recall it, that there should be a better bulwark to protect the individual from what you described as the large and ruthless corporation. On what experience of yours did you base that statement?

Mr. COE. Mr. Chairman, we expect to substantiate that statement by witnesses which we shall present the remaining part of the week to the committee.

The CHAIRMAN. I see. You are prepared to proceed with another witness tomorrow?

Mr. COE. Yes, sir; we will start tomorrow to introduce the testimony of the various witnesses referred to by Secretary Patterson at the opening of the hearings today.

The CHAIRMAN. Who will be the first witness to be called?

Mr. COE. Dr. Vannevar Bush, the president of the Carnegie Institution.

The CHAIRMAN. It is my understanding that Mr. Dienner will conduct the examination.

Mr. COE. He will conduct the examination.

The CHAIRMAN. Do any members of the committee desire to ask any more questions?

Senator KING. I should like to ask one question. Is it not a fact that a large number of patents issued have no utility——

Mr. COE (interposing). That is a fact.

Senator KING. And several hundreds of thousands of those issued never have been put into any practical use?

Mr. COE. That is a fact, sir.

Senator KING. Your office does not have anything to do with the granting of copyrights and the work which is being done by the Library?

Mr. COE. We do not administer the copyright law; we do administer one part of the copyright law which relates to prints and labels.

Senator KING. That is what I understood. Have you had any controversy growing out of your administration of that branch of the law?

Mr. COE. Nothing that I know of, Senator, except that in our own administration some people think it ought to be administered by the Library of Congress rather than the Patent Office.

Senator KING. I ask that question in view of the fact that representation has been made to me in favor of taking away from your organization and transferring to the Library the limited authority you have in administration of copyrights.

Mr. COE. There is a very interesting story back of that, Senator. Years ago the Library of Congress, the Copyright Division, seemed to have very lofty ideas about such matters. They didn't like to have in their office anything as practical and vulgar as a label for a tomato can, so they sent that all over to the Patent Office, and now there seems to be a change and they want to get that back.

ASSIGNMENT OF PATENTS TO CORPORATIONS BY EMPLOYEES

Representative REECE. I want to ask a question with reference to the custom of the assignment of patents into corporations. Is it customary when an employee of a large corporation conceives a patentable idea—and under the law he, as an individual, of course, makes application for the patent—for the assignment to be made to the corporation before the patent is issued, so that your 17.2 percent, being the percentage of patents issued to large corporations, includes in the main the patents of employees of the corporations? ¹

Mr. COE. I should say in the main, sir, yes; but, of course, it also includes any application acquired by the corporation prior to the issuance of the patent.

The CHAIRMAN. May I ask, Congressman Reece, what do you mean by patents of the employees?

Representative REECE. Under the law, if an employee of a corporation conceives a patent, a patented idea, he must make application as an individual. My question was if it was customary for him to make the assignment of the application to the corporation before the patent is issued, so that that group would be included in the 17.2 percent.

The CHAIRMAN. Of course, every patent must be applied for by an individual.

Representative REECE. But it can be issued to a corporation.

The CHAIRMAN. Yes. If a corporation is to receive it, the individual who applies for it must assign it to the corporation and there is, as I understand it, a Book of Assignments maintained at the Patent Office for that purpose.

Senator KING. However, some assignments are made weeks or months or perhaps years after the patent is issued to the individual.

The CHAIRMAN. Oh, yes.

Mr. COE. This chart ² is partially in answer to your question because it shows the number that were issued where assignments were filed prior to the grant, and the rest show the assignments of patents that took place after the grant, that were acquired by purchase from an individual after the patent had been issued.

As to all the rest in those groups, the patents were issued to the corporation before the grant of the patent.

The CHAIRMAN. Are there any other questions?

Dr. LUBIN. Mr. Coe, are there any data available which would show how large a percentage of these individuals were foreigners? ³ In other words, you have foreign corporations but you don't have foreign individuals.

Mr. COE. I don't think we have any. I suppose it could be ascertained.

Dr. LUBIN. I raise the question merely because it might have some definite bearing as to how the patent law is a stimulant to invention. Knowing whether any large number of foreigners who would invent and patent under foreign laws came here to patent something they had invented and patented at home, would have a definite bearing on the problem.

¹ See "Exhibit No. 186", appendix, p. 1126.

² See "Exhibit No. 188", appendix, p. 1127.

³ Mr. Coe subsequently submitted figures relating to the number of patents held by foreigners. They were entered in the record as "Exhibits Nos. 210, 211, 212, and 213" and appear in the appendix on pp. 1150-1152.

There is a second question I would like to ask if I might. Let's assume that you could so increase the staff of the Patent Office so that you could cut your 3 years to 2 or to 1 as the normal length of time. If such a thing were possible through sufficient funds or staff, what happens to your 20-year change? Then you have automatically expanded the period of 17 years to 18 or 19, depending on the time you cut down in your office.

Mr. COE. No; you never change the life of the patent itself. If we ever reach that happy situation where we could get rid of the applications in 2 years, the 20-year proposal would still cause that patent to expire within 17 years of the grant. We are not proposing at all or contemplating the enlargement of the patent period under any circumstances.

Dr. LUBIN. One final question which arises out of your question regarding the place of the large corporation dominating the field, particularly because of litigation and otherwise: Would it be possible for the record to recalculate your charts, "Exhibits Nos. 183 to 191", just the statistical material, and instead of calling a corporation which has \$50,000,000 worth of assets a big one, let's call a \$5,000,000 corporation a big one and see what change it would have on your charts.

Mr. COE. I think that study could be undertaken.

Dr. LUBIN. It might change the whole picture.

Mr. COE. It might. I still think you would find among that large group a great many patents that are exploited by very small corporations. Frequently, for example, almost inevitably when an inventor begins to exploit his own invention, the first thing he does is to incorporate, so that could be included in this group; "to small corporations" in "Exhibit No. 186", of all the corporations below 50 million assets.

The CHAIRMAN. It wouldn't be a difficult task for you to prepare a chart embodying the material Dr. Lubin suggests, namely, the number of patents held by corporations having assets of more than \$5,000,000 and less than \$50,000,000?

Mr. COE. It wouldn't be a difficult task. It would be a lengthy one, but we would be very glad to do it.

The CHAIRMAN. How long would it take you to do it?

Mr. COE. I would rather not estimate, Senator, but we could start it right away if you would like to have that information.

The CHAIRMAN. I think it would be illuminating.

Dr. LUBIN. If I might ask one final question arising from the answer Mr. Coe just gave, if the individual who has a patent and wants to exploit it usually incorporates, does that mean that these individual figures in the charts really mean nothing in the sense that most patents are exploited by corporations anyway?

Mr. COE. No; I don't mean to indicate that, because still included in your individual group are a number of patents that are exploited by corporations by license agreements, but I should say in my judgment it would be a healthier condition, sir. This is my own personal opinion, now, and not statistics. The more patents in this group "To individuals" on "Exhibit No. 186" that pass down into here "To small corporations" on the same exhibit, the healthier the condition, because it indicates that the patent has passed into the hands of the medium that ordinarily indicates commercial activity.

The CHAIRMAN. In other words, what you are saying is that most of the inactive patents are in the group labeled "to individuals."

Mr. COE. I didn't say that. I said it was likely that that is the case.

Senator KING. Isn't it a fact that with nearly every patent that promises some utility, the patentees form a corporation because they can more readily carry on the business, more readily obtain capital, sell stock to their neighbors or friends, and have greater access to the capital market through the instrumentality of a corporation than if they held the patents in their own name.

Mr. COE. I think that is the preferred method of carrying on business.

The CHAIRMAN. If there are no other questions, and if the witness doesn't care to add anything at this point, the committee will stand in recess until 10 o'clock tomorrow morning, and Mr. Dienner will proceed under the direction of the Commissioner.

(Whereupon, at 4:25 p. m., a recess was taken until Tuesday, January 17, 1939, at 10 a. m.)

INVESTIGATION OF CONCENTRATION OF ECONOMIC POWER

TUESDAY, JANUARY 17, 1939

UNITED STATES SENATE,
TEMPORARY NATIONAL ECONOMIC COMMITTEE,
Washington, D. C.

The Temporary National Economic Committee met, pursuant to adjournment yesterday, at 10:30 a. m., in the Caucus room of the Senate Office Building, Senator Joseph C. O'Mahoney presiding.

Present: Senators O'Mahoney (chairman) and King; Representatives Williams and Reece; Messrs. Henderson, Ferguson, Patterson, Frank, Peoples, and Thorp.

Present also: Senator Homer T. Bone, of Washington, chairman of the Senate Patents Committee. Counsel: John A. Dienner, special counsel for committee; George Ramsey, of New York, assistant to Mr. Dienner; Leslie Frazer, Assistant Commissioner of Patents; Justin W. Macklin, First Assistant Commissioner of Patents and Henry Van Arsdale, Assistant Commissioner of Patents.

The CHAIRMAN. The committee will please come to order.

Secretary Patterson, are you ready to proceed?

Mr. PATTERSON. Yes.

Mr. Chairman and gentlemen of the committee, yesterday, Mr. Conway P. Coe, Commissioner of Patents, appeared before the committee as a representative of the Department of Commerce to outline the history and operation of the patent system of the United States, concluding with recommendations designed to correct certain abuses with which his experience has acquainted him.

Today, we are to leave the broad discussion to receive testimony from users of the system. This testimony will be developed by Mr. John A. Dienner, who will conduct the examination of the several witnesses. Mr. Dienner is now serving as a special assistant to the Department for the purpose of these hearings. He has been actively engaged in the practice of patent law for more than 25 years. Since July 1933 he has been a member of the Patent Office Advisory Committee, appointed by the Secretary of Commerce, and has participated in all its deliberations and in its consideration of many phases of the patent system, both procedural and substantive. Mr. Dienner has been a deep student of the patent law and its operation in this country and abroad, and at present is the president of the American group of the International Association for the Protection of Industrial Property. Along with Commissioner Coe, he was sent by the President to London in 1934 as a delegate to the London Conference for the Revision of the International Convention for the Protection of Industrial Property. He is a past president of the Chicago Patent Law Association.

I acquaint the committee with these qualifications of Mr. Dienner in order that you may utilize his talents to the fullest extent, and I am sure that he himself will be willing to assist you in clarifying the testimony of any of the witnesses at any point of the proceedings.

The CHAIRMAN. Thank you, Mr. Secretary.

Mr. Dienner, if you will be good enough to call your first witness, we will proceed.

Mr. DIENNER. Dr. Vannevar Bush.

The CHAIRMAN. Dr. Bush, do you solemnly swear that the testimony you are about to give in these proceedings shall be the truth, the whole truth, and nothing but the truth, so help you God?

Dr. BUSH. I do, sir.

TESTIMONY OF DR. VANNEVAR BUSH, PRESIDENT, CARNEGIE INSTITUTION OF WASHINGTON, WASHINGTON, D. C.

Mr. DIENNER. Dr. Bush, will you please state your name and occupation?

Dr. BUSH. Vannevar Bush, president of the Carnegie Institution of Washington.

Mr. DIENNER. Dr. Bush, in approaching the problem of increasing industrial production, I think we might break the subject up into three or four general headings. We all agree that there is necessity for the production of new ideas and their introduction into industry. Now may we not break up our inquiry into the phases of how new ideas and with what concomitance they enter into industry; next, how industrial exploitation of new ideas is accomplished; further, in respect to patented inventions, with which we mainly deal, the termination phase of the patents and the delivery of the monopoly to the public. Then we shall take up general questions in relation to the introduction of new ideas into industry, and finally we would like to have you give your recommendations as a man especially qualified by reason of your investigation of the question of the introduction of new ideas in industry through the patent system.

With the brief outline of the headings under which we will proceed I would ask you, please, to state your qualifications as a witness to cover those points.

Dr. BUSH. I took my degree of doctor of engineering from Harvard and the Massachusetts Institute of Technology in 1916, and after that time, for about 15 years, I was engaged in consulting practice for industry, except for the interruption of the war, at which time I was engaged in research on submarine detection for the United States Navy. After the war I became associated with the Massachusetts Institute of Technology and combined academic teaching and research with the consultant practice. In my academic work, I was first an assistant professor and later professor of electrical engineering, and finally became the dean of engineering of the Massachusetts Institute of Technology and the vice president of that institution, at which time I relinquished my consulting practice and proceeded with that post for 6 years; and then became president of the Carnegie Institution of Washington.

In the course of my consulting practice, I was instrumental, with others, in the founding of several new companies, based on inventions, which companies have not made a great deal of money, but some of

which have been successful in the sense that they have furnished employment through the depression.

I was also chairman of the Committee of the Science Advisory Board which was requested by the Secretary of Commerce to report on the relationship of the patent system to the initiation of new industries in this country. I am also vice chairman of the National Advisory Committee for Aeronautics.

Mr. DIENNER. Then we might summarize your qualifications briefly as a man who as a graduate engineer has done practical work, an educator, consultant, and inventor, a director of research, an author, businessman, and a public servant.

Dr. BUSH. I think I qualify for all of those. I have about 20 or 30 patents in my own name.

INTRODUCTION OF NEW IDEAS INTO INDUSTRY

Mr. DIENNER. Referring to the first phase of our subject, which relates to the question of how new ideas get into industry, let me ask you whether you consider that the patent system has any place in maintaining and promoting industrial progress in the United States.

Dr. BUSH. There is not the slightest question that this country has a high standard of living as compared with other countries. That has been brought about for several reasons. First, this is a country of pioneers. The frontiers have disappeared geographically as the frontiers of technology have advanced. Pioneering experience still remains to a certain extent. That pioneering spirit, that willingness to take a chance, has been very important in our industrial advance. The existence of the patent system has made that work possible in industry; it has implemented the ingenuity, the resourcefulness, and courage of our people, and it is in no small degree responsible for the present high standard of living in this country.

Mr. DIENNER. Under modern conditions in industry, how do new ideas come forward? I mean by that, consider the individual, consider the corporation, or other forms under which enterprise is conducted. How do these ideas come forward? What produces them?

Dr. BUSH. There are two ways that are important. First, they result oftentimes from the long program of research, careful and meticulous analysis of the situation by a group of men, through large industrial research laboratories or scientific institutions, and the like, which produce new knowledge out of which come new applications. In addition, there is the independent inventor, whose day is not past by any means, and who has a much wider scope of ideas and who often does produce out of thin air a striking new device or combination which is useful and which might be lost were it not for his keenness.

Mr. DIENNER. Considering the past history of the introduction of new ideas into industry, do you consider that the lone individual has in the past been an important factor in introducing such an invention as might form a taproot of an industry?

Dr. BUSH. He has been and still is a very important factor.

RESEARCH

Mr. DIENNER. You speak of research. Will you please explain so that we may understand the term and its implications what is gen-

erally understood among those who practice research, what that subject and what their activities may be?

Dr. BUSH. Research, of course, is broadly the discovery of new knowledge by systematic examination, and it can be classified on one basis, into pure basic research, applied research, and research for control of a product.

Mr. DIENNER. Do you consider that there is any fundamental difference in method between scientific and industrial or applied research?

Dr. BUSH. Not a fundamental difference.

Mr. DIENNER. What institutions in the United States are most active in carrying on scientific research?

Dr. BUSH. You mean by that, I suppose, basic and fundamental research.

Mr. DIENNER. Yes.

Dr. BUSH. That is carried on primarily in our great institutions of learning, in our academic institutions, universities, and the like, and also to a very considerable extent in industry itself, for the great research laboratories in this country in industry carry on basic research as part of their activity.

Mr. DIENNER. Is there any fundamental difference in industry itself as to scientific search for principles, or the application of those principles in applied research?

Dr. BUSH. There is considerable difference in the way in which it is controlled. In pure research, basic research, men are left comparatively free to follow out their own ideas. In applied research they are of necessity guided in the direction of interest of the company which employs them.

Mr. DIENNER. Now, what are the relations between research and the patent system, briefly?

Dr. BUSH. Research has two products; first, new scientific knowledge, new principles, with which the patent system has nothing to do. A new principle is not patentable. But research also results in new combinations, new devices, which are patentable.

Mr. DIENNER. What are the limitations in research, if any, in regard to producing new ideas? Is there any likelihood that henceforth all new ideas will be brought out through the research laboratories?

Dr. BUSH. No, I am quite sure that that is not the case. In the first place, there is no limit to the new ideas that can be produced. We are not at the end of industrial advance, we are not at the end of scientific advance, by any means. New ideas are coming forward with as great frequency today as they ever have, and while a great research laboratory is a very important factor in this country in advancing science and producing new industrial combinations, it cannot by any means fulfill the entire need. The independent, the small group, the individual who grasps a situation, by reason of his detachment is oftentimes an exceedingly important factor in bringing to a head things that might otherwise not appear for a long time.

Mr. DIENNER. In industrial research, particularly, how can that be supported financially?

Dr. BUSH. Industrial research is supported, of course, by industry, because it furthers the progress of that industry and it can further it in two ways, by bringing out a better understanding of industry, by developing the scientific principles on which that industry is based,

and also by bringing out new ideas which can be patented, which can go into industry, which can produce a new profit.

Mr. DIENNER. Do you consider that the patent system, even with the advent of research organizations, can retain its democratic character?

Dr. BUSH. The patent system is decidedly a democratic affair, for it offers the same opportunity to any individual of this country, no matter where he may be placed. He has the same status before the Patent Office. He appears there as an individual and from that standpoint it is an exceedingly democratic thing which, of course, I think is a very important aspect of it. I think there is no threat to that situation due to the existence of the great research laboratories.

Mr. DIENNER. Considering a byproduct of research, and that is the question of new principles, how does the research laboratory serve the public in respect to new principles not covered by patents?

Dr. BUSH. This country is dependent, as is any country, in the great competition that there is in the world today, for the advancement of science within its borders—

The CHAIRMAN (interposing). Mr. Dienner, may I interrupt you? It might clarify matters if you were to indicate just what you and the witness mean by a research laboratory, from the point of view as to whether or not it is the institution of an individual or the institution of a group of individuals.

Dr. BUSH. We have all types, Mr. Chairman. We have research laboratories such as those over which I am at present presiding, which are endowed institutions, a group of individuals brought together with special knowledge.

The CHAIRMAN. Let me explain what I have in mind. You began your testimony with the statement that geographical frontiers have disappeared, but that the scientific frontiers are still with us. That is a very common statement which is being made on every hand these days, but attention is not always called to the fact that when we had a geographical frontier with us the individual, by his own efforts and his own resources, could support himself on the land, but that with respect to the scientific frontier, the individual does not have that freedom, and I suspect that one of the questions before the committee, one of the questions before the whole country, is how, with the new frontier, the individual may protect himself. We have a system developing of collective action, so that the individual now is one of a group, so it is important for us to know, in studying patent questions, whether or not this research of which you speak redounds to the benefit and liberation of the individual or of a collective group.

Dr. BUSH. And if we can make progress in that direction I will be very happy in having been of aid, for I, too, have wondered whether, as we have our recent trends today, the individual is disappearing. Personally I don't think he is. Certainly in pure science he is not. In pure science today the individual can map his own path and make his own recognition as an individual.

The CHAIRMAN. All the testimony which has been presented to this committee thus far with respect to research laboratories rather indicates that these are instrumentalities of large groups and that the individual inventor subordinates himself to the rule of the laboratory, and whatever he invents, whatever he discovers, he contributes to the group activity. Of course, in return he is paid a compensation by

way of salary or wages or what-not. But it is the phase of this study which I think we should all keep in mind all the time.

Dr. BUSH. And as I tried to bring out, that is one phase of the production of new ideas, a very new and I think beneficent phase, a group phase, but the individual phase has not disappeared and there still are in this country plenty of individuals with ideas which are important which ought to go into industry for the benefit of the people of the country, produced not by group work but simply by reason of the fact that there are individuals who have that keenness of analysis, of grasp, which enables them to see long before anyone else in the population a trend and a need, and to put together a combination or device which will satisfy it, and we need those people. They have been very important in the advance in the past and we need to facilitate their action in the future.

Mr. DIENNER. Does that approach an answer to your question?

The CHAIRMAN. I don't know that either of you has specifically defined the particular research laboratory that you have in mind in your present questions, but I rather think we understand one another.

Mr. DIENNER. It might clarify the situation to have the witness point out that any patent, after all, is taken out by an individual, whether the individual be in the research laboratory or be working individually. Nevertheless, any patented idea is essentially the idea of one man, or of several men working on the same concept.

The CHAIRMAN. Yes; but testimony which was introduced yesterday by the Commissioner of Patents indicated that a very substantial number of patents now outstanding were issued to corporations and are held by corporations, and that a very large percentage of the patents which are held by individuals are the patents which are not active, and of course we all know that a very large proportion of the patents are not useful patents, they are trivial, and do not add a great deal to the sum total of human knowledge or industrial activity, so that the picture which has been presented to us to date is of a patent system which is being used by the collective corporate system, and to my mind the big problem is to find how that system can be made to serve the better interests of the individual.

For example, in the question of employment, we all realize that, while industrial development in the United States has been perfectly tremendous and marvelous, nevertheless it is accompanied by an appalling problem of unemployment, which again indicates that operating on the new frontiers we have not been able to do what the pioneers in the days of geographical frontiers could do; namely, find a way of supporting the individual properly.

Senator KING. It might be added—I will put it in an interrogative form—had it not been for the development of these patents and their utilization by corporations, might there be more unemployment?

The CHAIRMAN. That is not the question.

Dr. BUSH. I might add a word to that. We want to be careful that we do not confuse research laboratories with large research laboratories. Now, I remember the research laboratory with which I was associated in the early days which produced, it happened, a new industry. It consisted of four of us, and we were a corporation; but it was essentially an individual effort for bringing into use some ideas. Now, every industrial affair was once small, and I think my own attention is particularly on the point that the Chairman has

brought up, the need for facilitating the progress of these small things which may grow into large ones.

Senator KING. There are small research laboratories and, indeed, sometimes an individual may have a laboratory of his own in which he is engaging in reasearch in some particular line of industry or invention.

Dr. BUSH. The National Research Council, the Division of Engineering of which I am now chairman, produced a list of research laboratories in this country. There are about 1,500. The great bulk of them are made up of a few men, 10 or so.

Senator KING. I recall that the vacuum tube was invented by a young chap in my State who silently worked, and without support of any character or kind developed the vacuum tube, which was really the beginning of the radio system as we now enjoy it. He had no help. He was an inventor all by himself and had his own research laboratory which perhaps cost \$100.

Mr. DIENNER. Senator King, we shall later have a witness from your State who will tell that story.

Dr. Bush, in the employment of the research laboratory as a means for producing inventions, do you consider that it is likely to produce a more orderly or a more regular flow of inventions than that which might be generated and introduced into industry by individuals?

Dr. BUSH. Certainly, a great research laboratory devotes its primary efforts to a systematic development of a system or a group of products over which it has privilege.

Mr. DIENNER. Then we should look forward, if the system of research grows in industry, to a more steady but perhaps not as spectacular growth, other things being equal.

Dr. BUSH. If the great research laboratory were the only means by which new ideas came into being, that would be the case. I hope that will never be so.

Mr. DIENNER. Now turning to another form of research which has some bearing on the development of industry, will you tell us briefly about nonprofit organizations or organizations not for profit maintaining research and research laboratories?

Dr. BUSH. The great academic institutions of this country of necessity maintain a great deal of scientific and technical research, for the simple reason that the highest form of instruction, the highest form of teaching in its advanced stages can be given only in the presence of research. They necessarily extend the frontiers of knowledge at the same time that they are teaching, so that you will find all of the better academic institutions of this country doing research within their corridors.

And then there are in addition organizations that are nonprofit organizations, endowed, formed for the simple purpose of advancing knowledge, such as the Carnegie Institution of Washington.

Mr. DIENNER. I wish you would tell us briefly by reference to competition with foreign laboratories what the necessity is for us in maintaining our research here in the United States at a high pace.

Dr. BUSH. This is a world of competition. I think that if we are to hold our position in a competitive world, we need to be in the forefront of science, we need to be in the forefront of its applications, and we can do so only by having the facilities for research, and more

important of course the people for research, the young people who are trained and are able to work in that field.

Mr. DIENNER. Do you know how research is carried on, for instance, in Germany as compared with methods here?

Dr. BUSH. The primary methods are essentially the same. Of course the control is quite different.

Mr. DIENNER. In what respects?

Dr. BUSH. Research in the academic institutions and in industry in general to a considerable extent is controlled by or greatly influenced by government.

Mr. DIENNER. In other words, we must compete more or less in a democratic fashion with research conducted in somewhat more a regimented fashion or controlled fashion.

The CHAIRMAN. I wonder if Dr. Bush wouldn't develop that thought a little more clearly. You refer to the system in Europe as being controlled more or less by government. Now, that covers a lot of territory.

Dr. BUSH. In some places, of course, it is more and in some places it is less. I was in Russia about 11 years ago, and there every piece of research, every laboratory, every individual working in science or in its applications, is very definitely controlled by the needs of the central government and their interpretation to him. He is directed definitely in the lines in which it is desired that he should function.

The CHAIRMAN. Does that mean that he is restrained from making research that he would like to, or making discoveries which he desires to make, or does it mean merely that what he does is done primarily for the benefit of and at the direction of the Government?

Dr. BUSH. It means both.

The CHAIRMAN. Of course that is a matter of extreme importance.

Dr. BUSH. Of course the Russians have produced great scientific things, and in recent years. In mathematics, for example, they have done excellent things, and some of their men in pure science are given the freedom to enable them to do such things, but the industrial research and the research generally is closely directed or closely oriented to certain lines and under very definite control. We do not have the independent man there as we have in this country.

Mr. DIENNER. Dr. Bush, I wish you would give us a word on the importance of having research organizations available for emergency needs, such as for wartime purposes or in case of epidemic or the like.

Dr. BUSH. Those are two questions. In regard to the first, if we get into another major difficulty, one of the primary things that we would need is a group of trained and able individuals capable of advancing the means of warfare, and I regard it as highly essential, as a part of our national defense, that there be encouraged in this country research laboratories of all kinds, the training of research personnel to a high degree in order that they may be readily available if they are needed in an emergency.

Senator KING. That applies in the chemical field, I presume.

Dr. BUSH. I think it applies in every field.

Senator KING. The biological too?

Dr. BUSH. Biological, chemical, electrical fields. Of course, in the matter of public health a great deal may be said. We have come far in this country due to medical research, and the progress has not stopped by any means in that regard. We are not beyond the time

of possible epidemics; we may again meet difficult problems in this country in epidemics, and if we do our resistance to those will depend upon the skill and number of organizations and men in medical research and the allied practices.

Mr. DIENNER. You have touched upon an interesting subject, namely, the medical research by scientific or highly scientific research. Could you tell us whether institutions which carry that subject on avail themselves of the patent system?

Dr. BUSH. Some of them do and some of them do not. Medical research today of course covers an enormous field. The impact of the physical sciences upon the biological has been very striking. We have, for example, such a thing as very high voltage machines for producing intense X-rays for cancer treatment, a striking problem in recent years. There are physics laboratories built up principally for the study of atomistics, with which there is a great deal of fascination, but the final product is used directly in the treatment of cancer. So that when we say "medical research" we must include a great deal of research outside of the medical field.

Mr. DIENNER. In medical research and particularly where the product of such research may be dangerous if improperly administered, or habit-forming, or something like that, I understand the patent system is used to control those things. What is your experience?

Dr. BUSH. My experience directly is this. I was chairman of the committee up at Massachusetts Institute of Technology which handled the patent affairs for that institution, and that institution, together with many other nonprofit organizations, does deal with the matter of patents, for several reasons, one of which you have mentioned; the dangerous pharmaceutical coming into public use needs to be controlled for the benefit of the public, to guard the public against its improper use, its improper manufacture, and one very effective way of exercising that control is through the patent system. But there are many other reasons why in my opinion academic institutions do use the patent system.

The CHAIRMAN. Who should exercise that control?

Dr. BUSH. I can recite the way it is done at the Massachusetts Institute of Technology, which I think is an excellent procedure. The committee of the faculty which has the handling of the affair has no authority but simply makes recommendations. If an individual on the staff makes an invention, he is bound to tell the committee of it, and the committee then recommends to him how it should be handled in order to bring it properly into use for the public benefit and in a legitimate and reasonable manner. Their recommendations in the 6 years that I sat in that committee were always followed.

The CHAIRMAN. Were always followed?

Dr. BUSH. Were always followed. I know of no case in which a recommendation to a member of the staff was not followed by the individual. The recommendation very often takes this form. They recommend that he assign that patent to an organization which can handle the legal, the business aspects of it. One very effective organization in that field is Research Corporation of New York, which is a nonprofit organization founded for that very purpose, and the individual then makes a contract with Research Corporation whereby Research Corporation takes over the patenting and commercialization

of the idea, pays the individual a part of the receipts, uses a part of the receipts for its own purposes, and donates in the form of a grant a portion of the receipts to the organization in which the man has his place. In that way, all of the profit, all of the net income except the amount paid to the individual himself becomes utilized for further scientific research, because both of the organizations involved are nonprofit organizations bound to utilize their funds for the benefit of the public. Research Corporation makes grants to scientific institutions, such as Massachusetts Institute of Technology, either in research or in education.

The CHAIRMAN. And who in the Research Corporation has the authority to determine what the public interest is?

Dr. BUSH. The board of directors and the board of trustees of that organization.

The CHAIRMAN. How are they selected?

Dr. BUSH. It is a self-perpetuating organization formed in the same way that the board of trustees of an educational institution is usually formed.

The CHAIRMAN. So that the proper functioning of this board rests, of course, in the last analysis upon the good faith and the intelligence of the members of the board who perpetuate themselves.

Dr. BUSH. That is right, sir, and if we did not have at the Massachusetts Institute of Technology great confidence in their intelligence and integrity in the public interest we would not recommend the individual going with them. They are a distinguished group and have shown great intelligence.

Senator KING. Are they selected from various institutions of learning?

Dr. BUSH. No, sir; they are self-perpetuating; they select their own successors. Research Corporation is a queer organization, in a way. It is founded under the laws of New York but it owns all of its own stock, by reason of a special act of the New York Legislature. I told Mr. Elihu Root that one time, and he told me that perhaps I was dealing with a ghost, that this organization might have disappeared and might not have found it out. It is rather peculiar in its organization. By reason of the fact that it owns all of its own stock and of course is unable to pay a dividend, it becomes a nonprofit organization. It uses its entire income, net income, in accordance with its charter, for grants-in-aid to scientific research.

Mr. PATTERSON. I think the committee has in mind what qualifications are necessary for membership on that board. When a man resigns and a successor is elected, are there any particular qualifications?

Dr. BUSH. I don't know offhand whether there are any particular qualifications laid down or not.

Mr. PATTERSON. Beyond the matter of intelligence and public interest, are there any?

Dr. BUSH. I don't know, sir. There may be in their by-laws, but I don't recall.

Senator KING. By and large would you say that the public has been benefited by the operations and activities of this organization to which you have just referred?

Dr. BUSH. I think it has been benefited very greatly indeed in many ways.

Senator KING. In what respect, briefly?

Dr. BUSH. Well, for one thing Cottrell's precipitation of particles was turned over to that organization for the benefit of the public. He was, at the time of his invention, a Government employee, and while he might legally have used the result of his patent for his own ends, he did not feel that it was proper that he should thus proceed. He hence turned over his patent to Research Corporation, which has built up a considerable business about it, out of which it derives a very considerable income. Those patents have been well developed, well commercialized. The decrease of smoke in our cities, the recovery of industrial wastes, prevention of poisoning in agricultural areas, have been largely improved by reason of Cottrell's work, and the net results and profits that have accrued from that have gone in the form of scientific grants to increase research for public benefit in all sorts of places.

Senator KING. Would you say that organization has, to a very large degree, without any qualifications, the confidence of inventors and of the public generally who are interested in inventions and in technological developments?

Dr. BUSH. It has a very high confidence, indeed, as I know. I am going to confer with the president of the Research Corporation next week with regard to matters handled for the Treasury Department on the subject of narcotics.

The CHAIRMAN. Do these directors have the power to restrain the use of inventions?

Dr. BUSH. Certainly.

The CHAIRMAN. And have they ever exercised that power?

Dr. BUSH. Yes.

The CHAIRMAN. In what respect have they exercised it? Can you give us some examples?

Dr. BUSH. They have restrained the use in the case of the precipitation of particles patents themselves, the Cottrell patents of which I have just spoken; and I think undoubtedly in other instances—I can't recall at the moment, but in that instance they have limited the manufacture of those instruments for precipitation.

The CHAIRMAN. Describing the rule under which your staff at the M. I. T. operates, I understood you to say that each member of the staff is under obligation to contribute to the group whatever discovery or invention he makes.

Dr. BUSH. He is under no legal obligation whatever.

The CHAIRMAN. Oh, no; no legal obligation.

Dr. BUSH. He is bound simply by public opinion, the thinking of his colleagues.

The CHAIRMAN. And if he didn't do that he wouldn't be on the staff at all.

Dr. BUSH. Oh, yes, he would; he would be on the staff indefinitely, but he would not be regarded by the group as one who was playing the game properly. It is the public opinion of his associates that controls.

The CHAIRMAN. Have you had any experience of any instance in which there was a conflict of opinion as to what should be done between the inventor and the group?

Dr. BUSH. No, sir.

Senator KING. Would you say that the activities of this organization and its plan of procedure make for monopolistic control of any industry or of any invention?

Dr. BUSH. No; it is quite the contrary, sir. The policy as adopted by the Massachusetts Institute of Technology recites many things, one of which is that the exclusive license should be used only when it is considered necessary in order to bring the device into use, and that the general policy should be one of general licensing.

Senator KING. And then a large corporation, or a small corporation, for that matter, or individuals who are engaged in industry avail themselves of some of the inventions or discoveries of this organization?

Dr. BUSH. Oh, yes. And the general procedure in most cases has been that the Research Corporation license all who are capable of handling the invention properly and reasonably.

The CHAIRMAN. How large a staff does Research Corporation have?

Dr. BUSH. I don't really know. They have quite a bit of manufacturing activity of their own and the staff there I don't know.

The CHAIRMAN. Could you state approximately?

Dr. BUSH. Approximately in the headquarters office where they are handling the business and contractual affairs, and so forth, I should judge about 30 men.

The CHAIRMAN. Who fixes the salary?

Dr. BUSH. The board of directors.

Mr. DIENNER. Dr. Bush, referring to the production or generation of ideas and introduction of them into industry, particularly in respect to the patent phase (I assume you are familiar with the operation of the Patent Office and the patent system in what we call ex-parte prosecution, from your own experience), do you consider that in that phase of the system there is any bias or unfairness, either to the individual or to the corporation?

Dr. BUSH. In all of my contact with the Patent Office, sir, in 20 years, I have never seen the case in which there was the slightest suspicion of unfairness. The Patent Office, in my opinion, handles the ex-parte procedure in a highly efficient manner and with the greatest fairness, holding the balance of justice. There may be disagreements with its action. Of course, many people may not agree with detail, but I think all comers are handled on the same basis.

Mr. DIENNER. So that we might say that in the application of that phase of the matter, that is in a securing of the patent, the Patent Office would not really feel any distinction as between inventions produced by large corporations through research or otherwise or the lone inventor?

Dr. BUSH. I never in my experience have seen any indication of it.

THE INTERFERENCE PRACTICE

Mr. DIENNER. In regard to the interference practice, which we have briefly discussed yesterday, do you see any advantage of a large corporation over an individual or any class of persons having any particular advantage in connection with this.

Dr. BUSH. In our interference practice at present, which is unduly long and unduly complicated and sometimes unduly expensive, there is of course a distinct advantage to the organization which has large resources as compared to the individual.

Mr. DIENNER. Turning now to the exploitation phase, that is—

Senator KING (interposing). Before you do that, I suppose there are many instances, however, in which a person in good faith, an individual or a corporation or a group, feels that the applicant for a patent is urging an invention or a discovery which one of the interferers claims to have been invented or discovered by him or by his associates, so that it would be improper to say that there should be no interference because that might deny the opportunity to a person who had a prior discovery from protecting himself and preventing a patent's being issued to some person who is a junior in the discovery of the art.

Dr. BUSH. I think, Senator, most of the interferences are in good faith. There are some that are introduced that are not, but most of them are in good faith; but an interference procedure is certainly necessary because, if the two individuals do make the same invention at nearly the same time, then the Patent Office has to find out which was the first. That is a necessary procedure. I suggest merely following the proposal of the Commissioner yesterday, that the procedure ought to be much simplified and shortened.

Senator KING. But you wouldn't deny the right of a person to file the interference?

Dr. BUSH. Not at all. I think it is a necessary thing that we find out, in the case of a disagreement, who was the first inventor.

Mr. DIENNER. Senator King, we will come to that phase of the matter a little bit later in connection with some recommendations which the witness has made heretofore.

PATENTS NECESSARY TO ATTRACT CAPITAL TO NEW ENTERPRISE

Mr. DIENNER. Referring to the exploitation of patented inventions in industry, can you tell us what the prime necessity for a patent is in the way of attraction of capital? Will you discuss that?

Dr. BUSH. Of course, before most inventions can be put into use, it is necessary to attract capital for their development and their introduction. There are some inventions that would go into use without that procedure, which would be automatically adopted without great cost, but in the case of most inventions, the expenditure of a considerable amount of money is necessary before they can be introduced into industry. The patentee, therefore, if he be an individual, is bound to make arrangements for the expenditure of that money before he can derive any income from his invention, either by licensing a company on a royalty basis or by securing new capital and founding a new company for the exploitation of the device.

Mr. DIENNER. Now, we have heard it said at times that a man will take out a patent in order to avoid having someone else take out a patent; what would be the disadvantage in that?

Dr. BUSH. That has, I think, no sinister aspect, as I understand your question. Of course, when an individual makes an invention, if he does not apply for a patent, he may find that someone else does and be surprised to find that the thing which he invented is now controlled by someone else and that he, himself, is barred from its use. That, incidentally, is one reason why nonprofit organizations find it necessary or desirable to deal with the patent system.

MR. FRANK. May I ask, out of ignorance, if he were the earlier inventor, wouldn't he be able to upset the patent if he could prove that fact?

DR. BUSH. If he was the earliest inventor and did nothing whatever, he would be regarded as having abandoned his patented rights.

MR. FRANK. Wouldn't that mean abandonment of the right? I am asking out of ignorance. If I invent something and don't patent it, someone else who may independently arrive at the idea might get a patent, but he won't be able to keep me or anyone else from using that idea.

DR. BUSH. Oh, yes, he would be able to keep you, yourself, from using the idea, even if it was originally your idea.

MR. FRANK. Even if I exploited it?

DR. BUSH. He would if you took no action in the Patent Office. If you applied for a patent yourself, you and he would go into interference in the Patent Office. If you did nothing, then he could obtain a patent that was valid.

THE CHAIRMAN. Has there ever been any suggestion to your knowledge that proof of prior invention should operate as a dedication to the public?

DR. BUSH. I don't like the words "dedication to the public," Mr. Chairman.

THE CHAIRMAN. Use your own phrase.

DR. BUSH. Of course, a patent can be proved invalid if there was a description of it in the literature 2 years prior to the application and the patent then becomes invalid and the idea can be used by the public.

THE CHAIRMAN. So that in that case the situation would be just exactly as Commissioner Frank described it.

DR. BUSH. Yes. If the Commissioner will permit me a moment more on that, scientific men are very often faced by that difficulty and often do not understand it. They feel that they have discharged their full duty to the public if they have published the new thing which they have found. They have not discharged their full duty because some other individual may come in and may patent that device, and if he applies within 2 years of the publication he may obtain a perfectly valid patent and he may use it in a way in which the original inventor would not approve at all. So that if one wishes to make an invention available to the public in the way that one desires, it is almost necessary—it is necessary—that he apply for a patent and utilize the system set up for that very purpose.

MR. FRANK. May it not be that puts such impediments in the way of development of ideas that the patent system to that extent is defective?

DR. BUSH. Sometimes it would work a bit of hardship, I am sure. That is, it forces companies to patent things which are not really of great moment, simply for fear that somebody else will patent. I think that is one of the secondary disabilities of the system but not nearly as important as some other disabilities that I see.

SENATOR KING. Take a case of this character, and some information came to me upon which I am basing the suggestion. A discovered what he regarded as a useful contribution to the art. He didn't take out a patent and he didn't attempt to utilize it. He gave some publicity to the small area in which he resided. B came along 2 or

3 years afterward. Whether he heard of A's invention I was not advised, but at any rate he took out a patent and he organized a corporation and obtained a considerable sum for the purpose of developing it, and many persons bought stock and went into the corporation and they developed a very profitable undertaking. Suppose now that A, who failed to get a patent, should come along years afterward and claim that he was the patentee of that idea, of that invention, though he didn't take out a patent; if he could prevail then B, with all of the investment which has been made, and the stockholders in the corporation, would be out and would lose all of the capital which they had invested.

Dr. BUSH. The law quite rightly says that A did not avail himself of the mechanism set up by law for the purpose of bringing inventions into use for the public benefit.

The CHAIRMAN. Have you fully explained your disapproval of the phrase "dedication to the public"?

Dr. BUSH. No, sir, I will be very glad to. Many individuals think that if they abandon all of their rights under a patent they are taking the best way of dedicating it to the public. I think that is quite an erroneous point of view.

The patent system was set up for the benefit of the public, not for the benefit of the individual inventor, and in order that devices might come into use for the public benefit. Now very often a device which is thrown open to the public so that anyone may make it, does not come into use at all. Many devices which require initial expenditure in order to bring them into use never attract that initial investment except from someone who expects to make a profit. In the absence of patent protection they do not come into use. Dedication to the public in the sense of general licensing with no royalty, therefore, often fails to produce the result that was desired. The utilization of the patent system in a proper way to insure that the device will come into use is the best form of dedication to the public.

The CHAIRMAN. In other words, you are telling us that the system which we have followed from the beginning here of having Government grant to the inventor a period in which he has the exclusive use of the device for the purposes of profit, if he so desires, is the best system of stimulating industrial progress and scientific progress.

Dr. BUSH. I think our history has proved that to be the case.

Mr. DIENNER. Mr. Chairman, might I answer Commissioner Frank's question as to a public use of an invention being a protection against a later patentee? The courts carefully safeguard the interests of any genuine situation where a man has actually begun the use of a device before someone else invented it and he has adequate proof of it. Of course there is in many a case the difficulty of proof, and the courts would never allow a man to say "I thought of that before the other man invented it," and allow that to stand in the way of a genuine development, and I think I might ask the witness, Dr. Bush, do you see any bias or any unbalance of the system which unduly favors either the inventor, the patentee, the manufacturer, or the public in its administration of this question of rights between the public and the inventor?

Dr. BUSH. No, I think so far as the Patent Office is concerned it is well administered indeed, except for the point which I have already brought out, and which was brought out by the Commissioner yesterday, that there is sometimes an undue and expensive delay.

Mr. DIENNER. I meant more particularly whether there is any hardship or unfairness as between a man who has once given something to the public without patent, freely opened it up, and then a later recapture, as it were, by a claimant. Do you know of any unfairness or inequality?

Dr. BUSH. I have known of many cases where individuals were disgruntled, of course, but I think in general the system works well, and in case of interferences it is well to bring out this point, that in a decision of an interference the Patent Office takes account of the original date of conception and of due diligence on the part of the two inventors, the date of reduction to practice and a number of other factors, before it makes its decision as to who took the necessary steps to bring this thing into use for the public benefit.

Mr. DIENNER. In other words, the matter is carefully safeguarded by both the Patent Office in the interference phase and by the courts in the litigation phase.

Dr. BUSH. Safeguarded very well, except for the items of expense and delay.

Mr. DIENNER. We shall go into that a little later.

"SUPPRESSION OF PATENTS"

Mr. DIENNER. Dr. Bush, we often hear complaint that there are suppressed patents. What do you understand by the term and do you know of any case of suppressed patents as you understand the term?

Dr. BUSH. The idea of suppressed patents may take several forms. One form that is fairly frequent is this: A company has two ways of accomplishing the same thing. It has two patents, either one of which it might use in producing a device for a given purpose, and it may produce one of those and not produce the other. I do not personally regard that that is a suppressed patent provided the public need is met.

Another form in which I have heard the term: The advent of inventions, the advent of industrial devices, is sometimes delayed because the company which controls the patent situation thereon does not produce the devices for the public use as rapidly as it might. That is again a matter which can't be settled in a moment, can't be dismissed in a word. Sometimes it is economically desirable that the obsolescence of equipment in the hands of the public be brought about deliberately and reasonably gradually, and not abruptly and suddenly, for sudden obsolescence would produce disruption, unemployment, and what not, so that I think oftentimes delays of that sort are justified.

Mr. FRANK. You think the judgment as to how long the delay should be, should be in the hands of the person who obtains the patent; or ought there be some public body which would exercise some judgment with respect to that?

Dr. BUSH. I feel, Commissioner, that there is no great danger in leaving that judgment in the hands of the company itself, for this reason: That this is a temporary monopoly which the company holds, and if it delays unduly it destroys its own monopoly because the patent is going to expire. If we had the situation of a permanent monopoly, it would be quite different.

The CHAIRMAN. The Commissioner explained yesterday that under the system which we now have the period of protection may be unduly

extended. An example was given, for example, of a patentable device, the period of protection of which covered 44 years.

Dr. BUSH. And, Mr. Chairman, I think that is an infernal situation that ought to be corrected.

The CHAIRMAN. So that with that qualification—

Dr. BUSH (interposing). Yes; in answering the Commissioner I had in mind that we were dealing with a system in which the normal period of 17 years obtained; with undue delays I would immediately say the matter ought to be corrected, but ought to be corrected by correcting the delays.

Mr. FRANK. But supposing that a corporation owned a patent and there was some other invention, some new device, which would be far better in the public interest, and it patented that new device and sterilized it for the full period of 17 years. Do you think that that is in line with the constitutional purpose or the constitutional power pursuant to which Congress enacts the patent laws?

Dr. BUSH. Commissioner, in 20 years I never have seen what I considered a bona fide case of suppression of that type. I have never seen a suppressed patent in that sense, and I think the reason is this. It is altogether too dangerous a procedure.

Let's take the example of the vacuum tank on the automobile. The patents on that system were pretty much held by one company which controlled the system of transferring gasoline from the tank to the engine by a vacuum device, and they had a group of patents which controlled that whole affair.

Whether or not they put out into the hands of the public the best form of that I can't say, but certainly they had an incentive to put out the best form of it. Moreover, they were vulnerable. One would have said offhand that they had the entire situation in their hands, but what occurred? Along came the motor gasoline pump and the vacuum tank became obsolete.

Every company is in the position, even if it has control of a particular device, that some individual outside may come on with a new and novel idea which will render their whole affair obsolete. The more complex their situation in some ways, the greater the danger, and they have therefore the greatest incentive to make the best device that they possibly can in view of the things that are in their hands, and my own experience and my own judgment is that there are no suppressed patents in that sense and that it would be very foolish for industrial concerns to have suppressed patents in that sense.

Mr. DIENNER. And you might say that a patent is a self-destroying monopoly in respect to the point of time, and one patent monopoly destroys another monopoly. They are not by any means continuing monopolies in themselves.

Dr. BUSH. Yes, although I think much can be said about monopoly based on a succession of patents.

Mr. DIENNER. Let's discuss that right now. Let's ask ourselves whether the monopoly of a patent is truly temporary, and under what circumstances it might be doubted that it is so.

Dr. BUSH. Well, I will take a moment to discuss that, because it can't be answered in one sentence. The original patent law contemplated an original inventor and gave him a monopoly for 17 years, after which the monopoly would terminate. That still happens today. We do have individual patents which stand on their own feet

and which are used for 17 years by the original inventor or his assignees and then go into public use.

But we also have various other situations, and one which is fairly clear-cut is this: The company has a group of inventions protected by patents. It has intensive research and as a result of its study and research it continually improves its product and takes out new patents, and in that way extends its monopoly.

My own point is this with regard to that particular form, that if a company can improve its product at the rate necessary to preserve its patent control, assuming again a reasonable expediency in prosecution and that we have no long delays, then I say that is for the public benefit. It is a monopoly which is made permanent for a time by reason of the activity of the holder thereof. It is bound to expire sometime and it is in general beneficial because of the incentive which that company has to greatly improve its product.

The CHAIRMAN. Is it possible for such a collective unit, by the use of this method which you have just described, to make it difficult, if not impossible, for a single individual to make effective an improvement in the same field?

Dr. BUSH. Yes, sir; and that brings me to the third form. It is not easy to prevent some individual from making the improvement, but it may readily be that if that individual makes such an improvement he will find himself in the position of having only one customer for it, so that an organization which has a patent control over the entire situation may therefore find it readily possible to acquire improvements which come from the hands of others, and to thus perpetuate, by aggregating to itself the improvements not only that it itself makes, but also the improvements made by others by purchase.

The CHAIRMAN. It would be possible, for example, for such an aggregation as you describe to use a device invented in good faith by an independent person, and individual, to appropriate that device, and compel the individual to resort to the courts for his protection.

Dr. BUSH. Of course, our entire patent system is based on the idea that any individual, if he thinks he is right, may make anything, and the recourse of the holder of the patent, no matter who he may be, individual or corporation, is to appeal to the courts.

The CHAIRMAN. Yes; but I am speaking now of policy. As I listen to you, I see this possibility, that a large corporation engaged in the manufacture of a certain type of product, some machine let us say, runs across a very valuable improvement which has been developed and invented and patented by an individual who is not an employee of that company and who, indeed, would like to sell the device to the company. The company, recognizing the value of the device, refuses, however, to deal with the inventor and says to the inventor, "You take your case to the court." Is that possible under this situation?

Dr. BUSH. It is possible, but it would be a very foolish thing to do, for a company which has an established business will certainly not go out and baldly violate a patent which is obviously valid, for it is so vulnerable that that becomes exceedingly dangerous. The individual, through the courts, can collect damages.

I have many thoughts on the cost of that litigation and I agree enormously with the recommendation of the Commissioner with regard to the simplification of that system, but even under the present circumstances, where litigation is relatively involved and unduly

costly, no company would go out and baldly violate an obvious patent in the hands of an individual.

The CHAIRMAN. Many complaints have been registered with this committee that that has been done in certain cases.

Dr. BUSH. We can come to that, if you wish. It is quite a story.

To go on for a moment with your question, if I may, sir, it can approach the individual to buy that patent or to buy rights under it, whereupon the individual has a choice between selling to one customer at the price set by that customer, or of waiting until the fundamental patents in the hands of the group expire, whereupon he can deal with his patent as he wishes.

PATENT POOLS

Dr. BUSH. There is no doubt that a group which holds the patent control on a particular field may, in that way, acquire improvements from individuals at times at small cost, and then to thus increase its control and continue its monopoly. I believe that that usually occurs only in the case not of individual companies but of cases where there are patent agreements between practically all of the units in an industry, so that we come immediately to the question of patent pooling, which is a large question, but in the case of the individual company I am not so afraid of that, for the individual company is too vulnerable. There is too much chance that exactly what happened in the case of the vacuum tank may happen to them, so that in general the individual inventor still has an opportunity to make a reasonable arrangement with them instead of waiting for the expiration of their patent.

Senator KING. Aren't there analogous cases in real estate? I am diverting for a moment. Take in the mining industry, there are hundreds of cases in which the owner of a mining claim, through underground workings, has abstracted the ore belonging to a contiguous owner, and he has insisted, after he has committed the trespass, upon buying the property for nothing or refusing to pay for it, and has forced the person who has been deprived of his property to resort to the courts. You can't guard against that. A man can resort to the courts to meet the trespasses here as well as trespasses in real estate. There are many cases in which the owner of the property has "fudged," to use a common expression, on the property of his neighbor (the neighbor was a poor man) and insisted that it was his property, and the poor man has been compelled to go into court. There have been thousands of cases where there have been trespasses on the surface which compelled the poor man to defend himself in order to maintain his rights. You can't guard against everything. The poor man has the courts. He may resort to the courts.

Dr. BUSH. But the owner of a valid patent which is obviously valid on the face of it, for an improvement which is a very necessary and important improvement, is in an exceedingly strong position no matter what the industrial situation may be, provided the procedure in the courts is sufficiently facile so he may be supported in his rights.

The CHAIRMAN. That is not the case now?

Dr. BUSH. Not in my opinion, sir.

Mr. DIENNER. Going back to the question of the temporary character of the monopoly, I believe you discussed the phase of overlapping patents owned by the same company, and you mentioned the question

of pools. Will you please tell us the character of the pool which you consider to be undesirable, and a character of pool which might not be open to that objection?

Dr. BUSH. That is a very large question, sir. The simplest situation that arises is this, where two companies or two individuals hold the patents, neither one of whom is able to manufacture on the basis of the patents which he holds, so that it is necessary for them to get together in some way or other before the device can go into public use. Obviously in such cases it is to the public interest that they should interchange rights under the patents. That is the simplest situation.

We have the more complex situation, however, where units in an entire industry interchange patents, and we have then what we might call a patent pool. In my opinion some types of patent pools are necessary and beneficent, and other types are undesirable. It is a very large question. I can mention only one or two points on it unless you wish me to go ahead.

One undesirable feature, I think, is this. If the patents are interchanged among the units of an industry on the basis of no royalty, I think that is undesirable, because the incentive which is provided by the patent system for progress, for research, for invention, is effectively canceled out in that event.

I think, also, that a closed pool which has no provision whatever, no workable provision, for the entrance into it of a newcomer who brings with him an addition to the situation, is undesirable. I wish very much that a beneficent type of pool, a desirable type of pool, could be defined and given public support or governmental support in this country, for I think it is a thing that we very much need. Pooling is necessary and desirable if properly carried out.

Mr. DIENNER. We might say this, that pooling goes to the aspect of proper use, but it endangers the aspect of termination. Is that right?

Dr. BUSH. If it is complete it practically cancels the aspect of termination if it is in an advancing art. In a static art, of course, it does not.

The CHAIRMAN. How does it cancel termination?

Dr. BUSH. If it is in an advancing art and if there is a complete interchange of patents between the units of an industry, and there is a provision so that new inventions as they arise may be brought effectively into the pool, then if inventions arise with sufficient frequency the monopoly in effect goes on and on, but of course if it is the type of pool that I just outlined, where there is an opportunity for the newcomer to enter into the pool, bringing with him his ideas or facilities, then it is not a monopoly in the real sense at all.

The CHAIRMAN. In other words, you object to the pool which excludes the newcomer, but the pool which would admit the newcomer you think would operate to the benefit of the people.

Dr. BUSH. I don't think we can draw it on that point alone. That is an important point.

The CHAIRMAN. What other points should be borne in mind?

Dr. BUSH. I think, for one thing, the one that I just mentioned. Reasonable royalties should be charged between the units of a pool in order that the incentive to progress be not canceled out. But there are several other ones. I think in general that pools are very

necessary in some fields, that they can be beneficial, and that if they have certain features which could be readily defined they are desirable and should be encouraged. Of course, the converse is also true—that I believe that pools very often have been disadvantageous in the past where they have not contained the desirable features.

The CHAIRMAN. Of course, that in turn raises the question of who should draw the regulations by which such a pool should operate. If the pool is one of very large corporations with a great many stockholders and many employees and deals in a product which is used widely by the public, then if the pool itself may, without any supervision, fix the regulations, the pool may impose its will upon the public. Is that not so?

Dr. BUSH. It could in an ideal case, yes.

The CHAIRMAN. I would scarcely use the word "ideal" in that connection.

Dr. BUSH. Having had a bit of mathematical training, I am likely to use the word "ideal" as meaning over-simplified.

Senator KING. You are familiar, are you not, with the testimony with respect to the pools by a number of manufacturers of automobiles, where the various companies, A, B, and C, to illustrate, had patents, and some were conflicting with the others, yet all of the patents aimed at the same thing, namely, the perfection of an automobile for the best interests of the public. They formed a pool, put all their patents in the pool, and A was permitted to use B's and C's patents, and B and C were permitted to use A's. Do you see any disadvantage in that?

Dr. BUSH. In general, that is certainly a desirable feature. It saves litigation and enables a product to be built, et cetera. If it is properly safeguarded, if there is an open pool, there is an opportunity for the newcomer to enter, it is not a monopoly, it is not closed, and I do not think that in that case there is any reason why it should be undesirable. I do think in the case of the automobile pool that it would have been better had they done certain other things. In fact, I disagree with their procedure with regard to the exchange of royalties. I think the automobile industry in this country would have gone ahead more rapidly if it kept the incentive of interchange of royalties on a higher plane.

Senator KING. You can't contend that it hasn't gone ahead rapidly when there are over 40,000,000 automobiles used by the public.

Dr. BUSH. Yes; but I notice that some of the very important advances in the automobile have come in Europe before they have come in this country, and as an American proud of our advance I prefer that they come here first.

Mr. FRANK. Dr. Bush, I quite understand that the patent system is highly desirable in enabling persons to obtain funds to exploit ideas which might not otherwise be exploited if there were no monopoly; yet I would like to ask, purely for information, the following question: As I understand you, nonprofit research organizations allow their patented inventions to be used on the basis of relatively small royalties and take out patents primarily to prevent the antisocial use of their inventions. That I understood to be the general point of view of such organizations. Now, bearing in mind what I said previously, that it is necessary to get funds through the patented monopoly in private industry in order to bring about the exploitation of new ideas, I would

like to ask this question: Would large corporations or small corporations which are profit-making organizations abandon their research work and their research laboratories if, when they procured patents on their inventions, they were obliged to give licenses on a modest royalty basis to all persons not intending to use the inventions antisocially?

TENDENCY OF COMPULSORY LICENSING TO DISCOURAGE INVENTION

Dr. BUSH. Some of them would; some of them would not. Some great research laboratories have other purposes than the mere production of patentable inventions. The research laboratory of the telephone company, for example, has many other functions and many other ideas. I can tell you that many would never come into existence and many research laboratories and many groups now and in the recent past striving to bring in new products would never have come about had there been any system of general compulsory licensing. I can tell you from my own experience that I was closely associated with the founding of several small companies in this country based on inventions, and no one of those would ever have come about had there been a system of general compulsion in licensing, so that having spent a great deal of money, they would have been obliged to license their competitors at a small royalty.

Mr. FRANK. Then you think that the profit incentive connected or associated with the monopoly created by a patent is essential if we are to have the development and exploitation of new ideas.

Dr. BUSH. Some things would come into use without it, but there are many ideas for which it is essential. Here is one right here. I was associated many years ago in the development of a thermostat as a consulting engineer. The invention was made by a young chap who at that time was a machinist at the bench. That device has come into use. It has gone into some 10,000,000 flatirons for their control; it has been of public service. It certainly prevented a great many electrical and flatiron fires; it has kept employment, it has done many beneficial things. That would never have come into use had there not been the exclusive right for a considerable period, for, simple as that device looks, it required \$100,000 of development before there was anything that could be used out of it. That thing is very interesting, Senator. You may have heard of it.

It is a piece of thermostatic metal which is just like the bottom of an oil can and snaps back and forth, but since it is of thermostatic metal, if you change its temperature it will itself snap. It is a very simple idea, yet it proved to meet a great need. It is a difficult thing to produce a thermostat which will operate in a flatiron at the high temperatures and successfully break the electric current. This thing acts with such great abruptness that it can break a current even under very difficult circumstances, and hence it became used in that field where it was not possible to use the prior devices.

The young man brought that out. There was a company formed around him holding a series of patents, and the company is still going and having its troubles. I consulted for it in its early days. This is supposed to operate at body temperature; except for the fact that my hands are cold this morning I could show you how it is supposed to

go. Thermostatic metal, you know, is two kinds of metal joined together in a sheet with different coefficients of expansion. That was old in the art before this work started. There were a number of expired patents on it, so it was public property, but the general scheme of making it in that little form was utterly new. There, for example, is a thing that never would have come into use if it hadn't been for the exclusive right.

Mr. DIENNER. What would you say the cost of developing that thermostat was?

Dr. BUSH. We spent about \$100,000 on development before it went into any uses whatever. I have a couple more of those, I think. When I knew I was coming down here I looked in my desk and found that I had just four of those left.

The CHAIRMAN. I hope the witness doesn't believe the members of the committee should have something to play with.¹ [Laughter.]

Dr. BUSH. Mr. Chairman, I can assure you that that device at one time held up all procedure on the Boston Stock Exchange for 5 minutes.

The CHAIRMAN. Were they able to make them snap?

Dr. BUSH. Only practice and warm hands will make that snap properly.

Mr. DIENNER. Dr. Bush, in the use phase of the patent, that is introducing the invention into industry, we have this question of price control to consider; that is, there is price control under patents. Will you please explain a situation under which price control is a necessary requirement in introducing an idea into industry?

Dr. BUSH. It is a part, of course, of the situation that I just mentioned, where the introduction of an invention requires a large initial investment. The funds for that can be secured only if there will be a speculative profit, only if the individual who puts up the money can expect that if the gamble is successful he will reap considerable profits. Now that procedure of putting the thing into use can occur either by the new company itself manufacturing or licensing for manufacture. If it licenses a single company for manufacture, it can give an exclusive license and collect a royalty. However, suppose that it licenses two companies. In order that there shall be at the outset a complete control, it is necessary that price restriction also be superimposed, otherwise competition will be produced between those units and the speculative profit which is necessary will not occur. The inclusive feature is necessary in order, in many cases, to bring the device into use, and there are circumstances, therefore, where price control is necessary in order to preserve the exclusive feature.

Mr. DIENNER. Then we might answer Commissioner Frank's question in some degree by pointing out that there is a necessary relation between speculative profit and exclusiveness.

I believe you have passed on the question of introduction, the possibility of using the patent situation for stimulation of new industries, and I believe you rendered a report to the Secretary of Commerce. I believe this report which you prepared as a member of the subcommittee of the Science Advisory Board is of sufficient significance that I should request its introduction as an exhibit in this case and that it be printed as an appendix in the record.

The CHAIRMAN. It is so ordered.

¹ Referring to exhibit of thermostatic metal.

(The report referred to was marked "Exhibit No. 206" and is included in the appendix on p. 1139.)

The CHAIRMAN. May I ask the witness to identify the Science Advisory Board?

Dr. BUSH. The Science Advisory Board, sir, was set up under the National Academy of Sciences by order of the President and requested to advise the several departments of the Government as requested, and this report was one result. The Secretary of Commerce asked that he be advised in regard to certain operations of the patent system in connection with the advent of new industries, so that this report was made to him.

Mr. DIENNER. Will you discuss for us briefly your view as to whether 17 years is a proper period for the life of a patent?

Dr. BUSH. Well, sir, we haven't really tried it out in recent years. I would like to see the situation brought into form so that 17 years would actually be the period, and then see how it works.

Mr. DIENNER. Answering the question in respect to the grant as being for a period of 17 years, do you have any comments as to whether you think it ought to be longer or shorter, assuming that delays in the Patent Office were reduced or eliminated?

Dr. BUSH. If the delays were reduced or if the 20-year rule were introduced as proposed by the Commissioner, then it seems to me that that is a good reasonable period.

Mr. DIENNER. To pursue the point further, Mr. Chairman, I should like to have the witness tell us briefly the purpose of the subcommittee's report and the recommendations which are attached to it in general.

RECOMMENDATIONS OF THE SCIENCE ADVISORY BOARD ON PATENT REFORM

Dr. BUSH. I can do that very briefly, indeed, since there are only three principal recommendations and a number of minor ones. The first one, and the most important one, is one that was presented to you yesterday by the Commissioner of Patents: the proposal that there be established in this country a single court of patent appeals in the form in which we proposed it here. It was also urged that this court be supplied with proper technical advice of its own in the consideration of patent cases.

The second recommendation, which is associated with that, is that there shall be supplied to courts of first instance in the consideration of patent disputes technical advice to the court as contrasted with the present situation where the only technical advice available to the court is by experts presented as witnesses. My committee felt strongly that the determination of a patent case involves the law and the facts, and the facts in a patent case are technical facts, properly understood only by men with a technical background, so there should be joined to the court for the proper determination of those facts individuals who have the proper scientific and technical background to understand them, rather than to expect a judge to acquire that necessary knowledge in the brief course of a suit.

Finally we made one recommendation in regard to the opening of patents before issuance not to contest within the general system but to the submission of additional evidence by anyone interested in order to increase the presumption of validity of issued patents. The

unfortunate situation that obtains today is that an individual who is granted a patent by the United States Government has not as great assurance as he ought to have that that patent is valid and will be sustained. Anything that can be done to increase the presumption of validity of that patent when it is issued will aid in the introduction of new ideas in industry, because it will shorten and make easy the path of the man who has to forge his way.

Mr. DIENNER. Then might we conclude from your statement that the one significant thing in your opinion for improvement of the system would be in the direction of increasing the presumptive validity of the patent when issued?

Dr. BUSH. Increase its presumptive validity when issued and make simple and inexpensive and direct the procedure by which that validity will be tested in the courts, if necessary.

Senator KING. May I ask one question? Who would select the supposedly nonpartisan adviser, technical advisers, to the judge who acts in the first instance?

Dr. BUSH. The court itself, sir, in my judgment should select its own advisors. There is no lack in this country of properly qualified scientific and technical men who are utterly nonpartisan, who have no connection in industry whatever in some cases, who would be available if called upon in a dignified way by the court. Many of them object to becoming experts for the reason that, because the procedure of the court is natural to the attorney, it is not natural to the scientific and technical man called by the court, but as an advisor to the court they would respond and there is no lack of eminent successful and distinguished men who would offer their services, who would respond to a request made that way by the court.

Senator KING. I recall, if I am pardoned a diversion, that in the many lawsuits over underground passes, or the determination of the forms in which the ore was found—because there were controversies as to whether it was dolomite lime or the various other forms in which the ore is found—in view of the fact that many of those lawsuits took up weeks, and experts from Germany and the leading geological institutions of the country came before the court—the plaintiff would have experts and the defendant would have experts—and the court, not being a geologist, would have difficulty in determining whom to believe. It was suggested that the court employ independent experts to aid him to disentangle the conflicting statements of the geological experts. There was objection made because they thought perhaps the court would find somebody who knew more or knew less, and there was a conflict as to who should guide the court in selecting the expert to advise him.

I was wondering if the same difficulty would not be experienced here.

Dr. BUSH. I would personally be quite content to see the court select its own advisors, and I feel quite sure that that would be done in such a way that perfectly adequate and impartial advice would be obtained in order to aid the judge in the determination of facts in a field of science, which by its very nature is one that he cannot know intimately and cannot learn in the brief space of a trial.

Senator KING. That would mean Congress would provide a fund from which the experts so selected would be paid, and the judge would determine the compensation which was to be paid them?

Dr. BUSH. Yes, sir. That compensation, I think, should be commensurate with their usual earning power.

Mr. FRANK. Dr. Bush, has any progress been made since the date of this report in classifying patents in the manner therein indicated into major and minor patents?

Dr. BUSH. The Commissioner of Patents and I have had a number of discussions on that. It has been discussed before his advisory committee. Progress has been made, but we have not arrived as yet at any consensus of opinion. It is a difficult thing to make such a classification. It is done, as you undoubtedly know, in Germany.

Mr. FRANK. Is there a body of literature on that subject?

Dr. BUSH. Yes, sir; quite a number of references.

Mr. DIENNER. I think the question of major and minor patents is provided for in the law of Germany, Japan, and Poland at present. Those are the only countries.

Mr. FRANK. Would it be any great burden at some time to supplement the record by a bibliography on that subject? ¹

Dr. BUSH. No difficulty. I haven't it offhand, but I think it can be obtained. I think the Patent Office Journal has such a list.

BEARING OF PATENTS ON STANDARD OF LIVING

Mr. DIENNER. One final question, Dr. Bush. How far would you go in a statement as to the influence of the patent system as a primary factor in producing in this country the highest standard of living in the world?

Dr. BUSH. It has been an extremely important factor in putting this country ahead of the world in industrial development. At the present time it is operating very lamely indeed in that respect. If we can remove some of the difficulties in the way of the pioneer, the technical pioneer, if we can make it more readily possible to establish new industries in this country based on inventions, if we can remove some of the difficulties of litigation, if we can simplify the procedure, then I think we have a reasonable chance that we can regain our position and proceed on the way. Unless we do that, our industrial progress will be permanently lost.

Senator KING. Isn't one of the difficulties of acquiring a patent in order to carry forward inventions with which we are familiar, because of high taxes or for other reasons, legitimate or illegitimate?

Dr. BUSH. High taxes come into it in another way. It is very difficult to secure funds from an individual if, under the conditions of failure he loses 100 percent, and under the conditions of success he gains 15 percent. That is most certainly a difficulty in the way of securing new funds for new developments. I do not think, however, that the taxes imposed by our patent system on the inventor are in effect a serious bar.

Senator KING. Do you perceive any reduction in the stream of technological development and of invention?

Dr. BUSH. No, sir; I expect an acceleration.

Senator KING. It seems to me there are more inventions these days than during the 10 years proceeding; by that I mean in this decade measured by the former decade.

¹ For brief bibliography on short term, minor or petty patents see appendix, p. 1157.

Dr. BUSH. There are plenty of them. The progress of the world is not stopped in any degree.

Representative SUMNERS. Unfortunately, I couldn't be here during the beginning of the testimony, and if any of my questions have anything to do with subjects which you already have testified on, I wish you would consider the question withdrawn before I ask it. I am interested in the statement just made. It may be expected that the continuing development of our genius as inventors will help us to retain our position in the world. As you visualize the future, would those inventions take the direction of helping us to produce cheaper and more efficiently, in the main, things we now produce, or produce new things which we do not now have, as distinguished from producing an old thing in a new way.

Dr. BUSH. I think both things will undoubtedly be accomplished. The extent of human desires is infinite. The extent of human needs may be bounded, but there is no limit to the number of new devices and new advances that can be absorbed by the public if they are produced at a reasonable cost and properly distributed, and we are nowhere near the end of new devices for the public benefit, new combinations, so that I fully expect the program will take two forms: the production of more of the usual things that we already have and in better form by better methods and the introduction of wholly new things.

Representative SUMNERS. I will stop you on that point. Would it mean a reduction in the unit cost of producing things which people now use?

Dr. BUSH. Yes, sir; that is one aspect.

Representative SUMNERS. Would that have a bearing in your judgment on the number of people unemployed?

Dr. BUSH. Yes, it has a bearing; a very definite bearing, and it has a bearing in both directions. Progress, sir, always pays for itself by at least temporary disturbance. If we have a static world, we can have a completely stable affair in which things do not change. That is very lovely in one way, but if we are going to go ahead technically or in any other way then we must expect at least local disruption and temporary disruption which means unemployment. There is no question, however, that the whole trend of invention, the whole trend of the introduction into industry of new devices and new ways of doing old things has been to greatly increase employment in the long run and in the end, so that it works in both ways; it produces in my opinion a temporary and local disruption but in the long run and over a considerable period generally increases the standard of living and increases enormously the potential employment.

Representative SUMNERS. May I ask you another question, as a scientist. These changes that result from scientific progress in the fields of mechanical things, may we expect that nature will more or less take care of the temporary addition of unemployment in the disruption or will we have to expect that there shall be some scientific developments to take care of the results of scientific development?

Dr. BUSH. I feel, sir, that if our procedure for the introduction of new industries in this country, for the commercialization of new ideas and new things had been faster, had been ready, had been easily operated in the past decade, we would not have anywhere near the problem that we now face in that regard. The fact that new indus-

tries have not come ahead, that their way has been inhibited in a thousand directions, is one of the reasons that we are in difficulty at the present time. As industries grow old, there must be the advent of new industries to pick up the slack or we will have difficulty.

Representative SUMNERS. I don't want to appear to be in opposition because I wouldn't even if I were opposed—I wouldn't expose myself to anything of that sort, but do you think there has been any lack of relative progress in the sciences, in scientific development in the last 10 or 15 years when we have accumulated some of our modern problems?

Dr. BUSH. No, sir; science has gone ahead at an accelerated rate.

NEED FOR SCIENTIFIC ADVISORS IN PATENT TRIALS

Representative SUMNERS. One other question. I thank you very much for answering those questions; it has been very helpful to me. Now, in regard to this expert to aid the court, would it be expected as a practical proposition that a group of scientists would be sufficiently expert in the whole field to constitute more or less professional advisers of the court or would you have to have for each particular group of patents that are under consideration, somebody who would have time to become expert, more expert, as expert as would be required in that particular field?

Dr. BUSH. I think the scientist that comes in that regard should be called upon to be expert not in the particular patents before the court, but in the science which underlies them.

Representative SUMNERS. That is rather important. Would you mind helping us on that? That is very important to me and I believe to my colleagues in this regard. You think then that a man who is trained in the general field of science and who has a scientific turn of mind could probably advise a court with reference to most any patent litigation.

Dr. BUSH. I think he could be of great help, indeed, sir.

Representative SUMNERS. I didn't get that across. I didn't mean somebody to be a great help but I mean as great help as somebody trained with reference to a particular group of questions involved.

Dr. BUSH. Oh, I see the point. I think we need both, sir.

Representative SUMNERS. You couldn't have them in one advisory court in the same lawsuit, could you?

Dr. BUSH. My committee did not recommend that we abolish the idea of experts called by the litigants.

Representative SUMNERS. I understand that.

Dr. BUSH. But that we supplement it.

Representative SUMNERS. But you are making a concrete suggestion with regard to court procedure which I am sure the members of the committee are very much interested in because you are getting down to something, don't you know. All this talking around doesn't get you anywhere but when you get down to a concrete proposition, that means something. That is why I am taking the time to get a pretty clear view of your notion because you are going away. When we come to details, could we hope to get the aid that you suggest by having some persons who possibly are attached to the judiciary to give this advice, or would you have to have somebody in each lawsuit who is particularly trained with reference to that particular group of patents?

Dr. BUSH. I hope ultimately, sir, that we will have both forms, that we will have permanently attached to the court of appeals scientific and technical advisers who will permanently be a part of the court, but that we will have in addition, particularly in the courts of first instance, individuals called as technical advisers to the court who are called for each case individually.

The CHAIRMAN. Mr. Dienner, that buzzer, of course, was the roll call in the Senate.

Representative SUMNERS. Why not hold it until there is something important and they call us over in the House.

The CHAIRMAN. In that event, we probably would be here all the time.

The CHAIRMAN. The committee will recess until 2 o'clock.

(Whereupon, at 12 noon, a recess was taken until 2 p. m. of the same day.)

AFTERNOON SESSION

The committee reconvened at 2:10 p. m. on the expiration of the recess.

The CHAIRMAN. The committee will come to order.

Dr. Bush, I think that all members of the committee this morning were very much interested in the testimony which you gave. I know that speaking personally, I think it was one of the most interesting discussions of the patent question which has been presented to our committee and it stimulated a number of questions in my mind, some of which perhaps we might be able to pursue this afternoon very briefly.

You are aware, of course, that this committee is operating by virtue of a resolution which was adopted by both Houses and signed by the President, which directed us to do certain things.¹ Among these was the direction that we should examine the effect of existing tax, patent, and other Government policies upon competition, upon price levels, unemployment, profits, and consumption.

VALUE OF PATENT SYSTEM IN REDUCING UNEMPLOYMENT

The CHAIRMAN. The part of the study with respect to the effect of patent law upon competition has already taken place and a hearing has been presented to this committee. It was demonstrated this morning that your experience has been so broad that I felt it would be very illuminating if you would give us briefly, perhaps, the benefit of your judgment with respect to the effect of the present patent policy upon unemployment.

May I say before you answer that as I conceive it, that is the pre-eminent problem before the people of the United States and indeed before the people of the world. We have a system which is operating very inefficiently. If we are to judge efficiency by the social security which it produces, our system does not produce social security.

What, then, can the patent system do, what does it do, with respect to unemployment? Would you care to give your views on that?

¹ Public Resolution 113, 75th Cong. Previously entered in the record as "Exhibit No. 2," see Hearings, Part I, appendix, p. 192.

TESTIMONY OF VANNEVAR BUSH, PRESIDENT OF CARNEGIE INSTITUTION OF WASHINGTON, WASHINGTON, D. C.—Resumed

Dr. BUSH. The patent system was designed expressly to bring out new industries in this country, and by so doing to advance the useful arts and science, and of course by increasing industrial activity and providing new products to provide for new employment. And that it did very effectively, very effectively because we went to the point where we had the highest standard of living in the world. Today, in my opinion, it is not doing that with nearly the effectiveness that it ought to, and if it were truly effective in that regard I think many more new industries would have sprung up in this country in recent years and would have provided a considerable amount of employment.

Now, that has not been the only factor, of course. You spoke a moment ago of the tax situation and its relationship to that problem, but from the standpoint of the patent system alone I feel sure that if it were operating smoothly and effectively so that the individual and the small group had better opportunity to bring out in this country new and desirable products, that the effect upon our unemployment situation would be very real.

The CHAIRMAN. What prevents the individual and the small group from realizing the potentialities of the system which was envisaged by the drafters of the Constitution who directed Congress to provide this patent system?

Dr. BUSH. Several things. I will draw on my own experience in that regard. I was one of a small group several times that were instrumental in organizing new companies, new industries, based on inventions, some 15 years ago. In my considered opinion, that same procedure would not operate today to produce the things that were then produced, given the same opportunity as far as the ideas themselves were concerned, first because it would be much more difficult, if not impossible, to secure the interest of men having funds which they could properly spend in speculative ventures in a new undertaking, where the risks are very large. Only men of large means can properly take the long shot that is involved, and men of large means today, with the taxation system that we have, are not inclined to take long risks, so that it would be very much more difficult to finance such an operation.

The CHAIRMAN. Would you want this committee to draw the inference that we should arrange our system now so that it would accommodate men of large means primarily rather than men of small means primarily?

Dr. BUSH. No, sir; so that it would accommodate both in combination, the man of large means and the man with an idea.

The CHAIRMAN. All right, but would you tie it to the opportunity of the wealthy man to invest his savings or would you tie it to the opportunity of the poor man, the individual, to attain proper development?

Dr. BUSH. I would tie it to both, for I think that only when you have the proper combination of the man with the good idea, the new thought, the new invention, and capital able and willing to enter into its development with it have you a combination which can produce new industries.

The CHAIRMAN. I judge from what you have said this morning and from what Commissioner Coe testified yesterday that the patent system as it now operates tends to restrict the opportunity of the individual.

Dr. BUSH. I feel that it does, and of the small group, and, incidentally, also of all those who use the patent system.

The CHAIRMAN. And in the recommendations which you have made as a member of this Advisory Committee, you have covered the field so far as your present studies have taken you?

Dr. BUSH. We made at that time three recommendations which we considered to be the three most important ones and a number of minor recommendations. I do not think that those would go the whole distance toward giving us a perfect system, but I think they would go a very long way toward improving it.

The CHAIRMAN. I glanced over this report by the Science Advisory Board,¹ and I found on page 29 this statement—it raises the same question which you raised at the very outset of your testimony this morning [reading from "Exhibit No. 206"]:

The frontiers have disappeared. No longer may a citizen break new ground beyond the horizon.

You refer there to a citizen being, I take it, the natural person.

But the opportunity for pioneering in the application of science to human need remains and calls for the same virtues of courage, independence, and perseverance. It still is possible to enter uncharted regions in industry and it is still hazardous to thus open new territory for the national welfare.

Now let me ask you there: Is it as easy for a citizen, a natural person, to penetrate these frontiers of science as it was for Daniel Boone and the geographical pioneers of our history to penetrate the geographical frontiers?

Dr. BUSH. I think the risks are quite comparable.

The CHAIRMAN. Is that your answer, taking into consideration also the accumulation of capital resources by large groups of individuals operating as groups?

Dr. BUSH. Taking into account the whole situation as I see it, I think the courage and resourcefulness called for today in a man who would break new ground in the industrial field, produce new companies, new products, for the benefit of the public, and the risks that he takes, are as great as the risks of any pioneer; and his reward ought to be commensurate with the risk that he takes.

The CHAIRMAN. Yes; but I have not made my question clear. You described to us this morning a system which is followed by the Massachusetts Institute of Technology.² As I understood it, you described the collective effort of a staff of an institution of learning. Now, my own feeling is that staff working together can probably produce better results than the individuals working separately.

Dr. BUSH. Oh, yes; in certain fields very much better.

The CHAIRMAN. So that illustrates what has been developing through our society in the last 50 years, namely, collective effort in science and in economics, so the question proposes itself, as it were: Is the individual who operates outside of a collective group protected in our present system sufficiently?

¹ See "Exhibit No. 206", appendix, p. 1139 at p. 1147.

² *Supra*, p. 577.

Dr. BUSH. In my opinion he is not, and I think the day of the pioneer is not past, the day of the individual inventor is not past, for fine as these cooperative groups may be and necessary as they are to our general progress in this country, they do not cover the entire field.

The CHAIRMAN. But the individual inventor as such is now under a handicap that in attempting to develop his invention he is forced to compete with collective groups.

Dr. BUSH. Oh, but he is always competing. He has difficulties of all sorts.

The CHAIRMAN. That may be, but this is a new sort of difficulty that he didn't compete with in the days when the patent system was initiated.

Dr. BUSH. Yes; I think today he merely has more artificial hazards which ought to be removed from his path because he has troubles enough anyway without taking into account the artificial ones.

NEED FOR SINGLE COURT OF PATENT APPEALS

The CHAIRMAN. Of course you have recommended, as the Commissioner of Patents has recommended, that there should be one single court of patent appeals. Now the primary argument which has been advanced to support that recommendation has been this: That the individual inventor is unable financially to follow a collective unit through the 10 circuits of the United States Courts of Appeals to establish the validity of his patent, and therefore is in danger of losing his patent to a collective group which is willing to seize the use of the patent and put the inventor to his remedy in the courts.

Dr. BUSH. Yes, and more generally the delays, burdens, costs of the present system, which I believe has grown to be unduly cumbersome, are a burden upon society at large, for they are a burden upon the progress of the new things which the country could use.

The CHAIRMAN. So that your recommendation with respect to improvement in the court system is designed to open the way for individual enterprise?

Dr. BUSH. Yes, sir.

The CHAIRMAN. And you recognize that individual enterprise is handicapped by the necessity now of competing with collective power of some kind or another?

Dr. BUSH. The individual small enterprise at the present time can go forward with surety only when it has in its hands patents of the validity of which it is sure, so that it can proceed. The present process for establishing without a doubt the validity of a patent is now altogether too cumbersome, and if it can be shortened new ventures can go forward with more assurance.

The CHAIRMAN. So now we have developed a realization of a certain amount of control of scientific development and invention by these collective groups which we may regard as private groups. With that in mind, I want to read the next paragraph in your report [reading from "Exhibit No. 206"]:

There has been a powerful trend toward stronger Government control of large industry in recent years. Unfortunately this has resulted in many measures which have borne heavily and which have added artificial hazards to those naturally in the path of new ventures. Independence has been curtailed.

What did you have in mind when that paragraph was written?

Dr. BUSH. I had in mind, and I think the committee as a whole had in mind, a number of things. I can illustrate by one thing, if you wish. I think the general procedure that has been adopted in this country in regard to the control of the issuance of new securities has been a desirable thing in order to protect the public. But along with that entire problem, an attempt to control and protect the public against the issuance of securities of no value, if you like, has come an additional burden upon new ventures, an additional cost, an additional amount of red tape in the furtherance of issuance of securities to the public for the financing of new affairs. That is one illustration.

The CHAIRMAN. You don't mean to intimate to this committee that it would be a valuable exchange to abandon the control or supervision which is now being exercised over the issuance of securities in order to obtain this greater freedom of which you speak.

Dr. BUSH. Not at all, sir. I hope that the benefits may be maintained and the disadvantages mitigated as time goes on.

The CHAIRMAN. Have you any suggestions as to how that might be done?

Dr. BUSH. No, sir; not without taking more time than I ought to take on that subject.

The CHAIRMAN. Well, now, if, by taking a little time, you could do that, I think I can speak for the committee in saying we will be glad to have a memorandum from you on that point.

Dr. BUSH. I will be very glad to go to work on that some time.

The CHAIRMAN. Because the more information we get the more likely we are to reach conclusions that will be publicly advantageous.

This whole question of the effect of patents upon unemployment, as outlined in our resolution, raises in my mind the question of what the effect is of labor-saving devices. Have you any opinions about that?

Dr. BUSH. Yes. It happens that in my own experience I have had very little to do with inventions which were brought out explicitly for the purpose of saving labor. I have perhaps 30 United States patents. I don't think any one of those is directed to the saving of labor as a means for the production of profit, and I very seldom encounter the group that is attempting to invent for that explicit purpose.

More generally, the cheapening of a product through the saving of labor very often results in its increased use, as we all know, so that the mere saving of cost in that way, in the production of a product, does not necessarily mean a decrease in the aggregate of labor used in that particular field.

The general result of all invention and all patents has been, first, to cause temporary dislocations in labor, but, second and more important, to increase very largely the potential call for labor in the country as a whole.

The CHAIRMAN. We have a condition which might be described as a race between the labor-saving device upon the one hand and the new invention upon the other, creating new demands. Would that be a fairly accurate description?

Dr. BUSH. We have a race between the tendency of old industries always to produce their products with less labor and the advent of new industries which are capable of picking up that labor and labor in addition.

The CHAIRMAN. Which is overtaking the other?

Dr. BUSH. Recently I think the advent of new industries has been so inhibited that it has not performed its proper part in picking up the slack.

The CHAIRMAN. How has it been inhibited?

Dr. BUSH. By lameness, by clumsiness in the patent system, particularly in the matter of litigation, and by the general situation in regard to the attraction of new and venturesome capital into new ventures.

The CHAIRMAN. The litigation system, in your opinion, is such that it restricts development, thereby restricting the opportunity for creating labor, new opportunities for labor?

Dr. BUSH. Yes, sir.

The CHAIRMAN. And you have taken that into consideration in the recommendations which you have made here?

Dr. BUSH. Yes, sir.

LACK OF SERIOUS ECONOMIC THREAT IN FOREIGN HELD PATENTS

The CHAIRMAN. Have you any suggestion to make to us with respect to the operation of our patent system upon the inventions of citizens of the United States and the inventions of foreigners?

Dr. BUSH. Of course, under our patent laws any individual who comes with a new idea is entitled to the protection of our patents and similarly American citizens may apply for patents in foreign countries. In my opinion, the American patent system is a far better system than is found elsewhere, far more favorable to the inventor. It has been my own personal experience that it is very seldom worth while for an American citizen to apply largely for foreign patents because primarily of the taxes which soon come to bear as a burden. In that sense, then, the situation as far as foreign citizens applying for patents in this country and Americans applying for patents abroad is not the same. They operate under different systems.

The CHAIRMAN. What I had in mind was whether or not in your judgment foreign inventors or foreign cartels, particularly, could use the American patent system for the purpose of preventing production or employment in this country.

Dr. BUSH. If the American patent system is operating properly for its intended use, for improving the standard of living of the American people, through increasing employment, through giving us new industries, then we don't care who uses it for that purpose. Any individual who uses it properly for that purpose will contribute to our general situation and to the benefit of the public.

The CHAIRMAN. I didn't understand that to be an answer to the question as to whether in your opinion the system as it now exists can be used by foreigners for the purpose of repressing production here.

Dr. BUSH. Oh, yes; it can.

The CHAIRMAN. Have you any suggestions to make to us with respect to remedying that point, that defect?

Dr. BUSH. I am not sure that it needs to be remedied. I think it would require quite a bit of study to determine whether that is on the whole a damaging situation at the present time.

The CHAIRMAN. Do you want us to draw the inference that you believe it may be beneficial on the whole that development could be suppressed or restrained?

Dr. BUSH. No, but I am not sure that that is sufficiently extensive to compensate for the benefit that is undoubtedly produced by having the foreigners come in here and introduce their ideas into the American patent system, which, of course, results in due time in their release to the public.

The CHAIRMAN. Does your experience enable you to draw any conclusion as to whether or not there are among these large groups which are now developing patents, understandings, and agreements which overrun national lines which include other nations as well as the United States?

Dr. BUSH. Well, I know, as I think is general public knowledge, that there are arrangements by which American companies interchange patents with foreign companies.

The CHAIRMAN. Of course, that wasn't in the contemplation of those who drew the original patent law. Have you any advice to give the committee with respect to recommendations dealing with that phase of the situation?

Dr. BUSH. I have never felt that the American businessman needed any great aid in that regard. I have always felt that he was perfectly able to take care of himself in that sort of situation.

The CHAIRMAN. That buzzer is a roll call and the members of the Senate are being called to respond to a vote. Senator King and I will have to go and I will turn the inquiry over to my good friend of the House of Representatives.

(The vice chairman, Representative Sumners, assumed the chair.)

Mr. FRANK. Dr. Bush, there is every indication that you have a splendid scientific mind and I therefore assume that in any subject with which you are dealing you want to be supplied with adequate data. I just want to suggest that if you care to, in preparing the memorandum to which you referred, you can avail yourself of the data that the S. E. C. has on the subject of the cost of registering new issues. I think it may surprise you to learn that the cost, particularly of the smaller issues, while it is larger proportionately than in the case of the larger issues, is by no means the impediment to the saleability of such issues, for we have hundreds of them registered and fully ready to sell and they have not been sold. But that and other related data, if you care to have it, we will put at your disposal.

Dr. BUSH. Thank you, Commissioner. I shall be glad to.

Mr. FRANK. May I ask you a question on the subject of your suggestion as to experts? It occurs to me that an interesting analogy might be found in the statute, the O'Mahoney-Chandler Act, that was enacted at the last session of Congress. Under that act the courts may call upon the S. E. C. for advice with respect to reorganizations. Would it be possible that a similar device might be used with respect to patents; for instance, that a group in the Patent Office might be set up, of experts upon whom the courts could call if they desired?

Dr. BUSH. Yes, it seems to me that that would be quite possible. I hoped personally that the matter would be broadened so that the court would be enabled to call upon the best man in the country on a particular field for advice in considering a particular issue.

Mr. FRANK. Would you think, to carry the analogy a little further, that it might be appropriate to allow the Patent Office, or some branch of the Patent Office, to apply to the court in any case where a patent suit was being heard and ask for leave to supply information to the court?

Dr. BUSH. Properly worked out I think that might be quite helpful. It is not exactly what my committee had in mind in making the recommendation.

The VICE CHAIRMAN. Are there any further questions, gentlemen?

Dr. Bush, there are one or two points, and I am constantly having to explain my embarrassment because I haven't been able to be here all the time.

I gather from the statement by the chairman that in your report,¹ which I unfortunately haven't had the opportunity to examine, that you found similarity between the condition of the individual pioneer and the person who is pioneering in the field of scientific discovery and invention. It occurred to me that the similarity probably would be more striking between the position of the discoverer of a new continent or a new island than it would be between the pioneer in the field of scientific discovery and the individual, in the relatively small number of people who can hope successfully to pioneer in the field of invention.

Dr. BUSH. I would compare the geographical discoverer rather with the scientist who spends his lifetime in discovering new knowledge, new relationships.

The VICE CHAIRMAN. I misunderstood your analogy. I thought from the question of the chairman that you had indicated a sort of broad, democratic opportunity in the field of scientific discovery, comparable to that which is afforded the pioneer who wanted to get an individual home.

Dr. BUSH. Of course, we have to contrast in all our thinking scientific discovery with invention, and the scientific discoverer is not subjected to the stresses of the pioneer in industry who makes and commercializes a patentable invention.

INVENTIONS AND EMPLOYMENT

The VICE CHAIRMAN. If I may, I would like to follow that just a little further and for my own information ask for a little more development.

Whatever that was [referring to buzzer], I wish it wasn't.

I refer to the practical situation, as I view it, that has developed by reason of a large number of unemployed people and the peculiarly distressing situation of the person along about 50 years old who has been released from some employment where he has been trained through his lifetime, and the apparent inability of organized society, or whatever you want to call it, to provide an opportunity for at least a relatively large number of people to find any sort of gainful occupation.

I wouldn't myself go so far as to say that there ought to be a cessation for a while of the inducement which the Government is offering for people who invent a machine who will give us some more idle people. I wouldn't like to go that far yet, but as a practical, common-sense proposition, we do recognize that we have so much more rapidly

¹ "Exhibit No. 206", appendix, p. 1139.

advanced in one of what ought to be, it seems to me, paralleling lines, where we have accumulated all these millions of people, and I question the common sense of continuing to try to hire somebody to invent a machine that will give us some more idle people by offering them a monopoly of 17 years of right to use.

I have traded all my life in the country, buying mules and yearlings and things, and it doesn't seem to me that is an awfully good trade. I can't figure it out.

Dr. BUSH. You and I, sir, approach this apparently from utterly different points of view.

The VICE CHAIRMAN. You are a scientist, and I am just an ordinary fellow around the country. I mean that.

Dr. BUSH. I am a boy from the country, too, but my own experience in this field has nothing whatever to do with that. One of the principal things that I was concerned with that was founded upon invention and that was dependent entirely upon the patent system for its continuance, succeeded in carrying through this depression with approximately a thousand men. Now, the pioneers in that thing made very little money in it; it hasn't been a money-making venture, but it has provided employment in a new field where men would not have been employed if those inventions had not been made.

The VICE CHAIRMAN. What is that, Doctor, what field?

Dr. BUSH. I am thinking of the Raytheon Manufacturing Co.

The VICE CHAIRMAN. What do they make?

Dr. BUSH. They make about a million thermionic tubes a month, radio tubes that go into the sockets of your radio set, and they were early in the field and have a large number of inventions in the general field, vacuum tubes and the like.

The VICE CHAIRMAN. That is the development of the use of radio, isn't it? It is a new field?

Dr. BUSH. Yes; that is a very new field; this was just one unit in it.

The VICE CHAIRMAN. I was wondering if you had an illustration of what we may call invention and discovery with reference to some established activity, well, anything.

Dr. BUSH. Well, take control devices, a very old field, a field where much work has been done for two generations.

The VICE PRESIDENT. What field is that?

Dr. BUSH. Controls, thermostatic controls, automatic controls of all sorts. I was associated—

The VICE CHAIRMAN (interposing). You mean instead of using the hand brake on a freight car you press a button or something?

Dr. BUSH. Yes; and offhand that looks decidedly like a field where labor would be displaced by making things automatic instead of hand operated. My own experience in that field has been this: I was associated with a group that started with some inventions and formed a little company which has gone on for 15 years and has provided new employment by providing new devices, things that the world had never seen and which are now being manufactured.

The VICE CHAIRMAN. Applying that to the railroads, how many people did you increase by reason of that automatic device, just dealing with that one thing? How many people did you increase in the operation of trains?

Dr. BUSH. This, as far as I know, has never gone into the operation of trains. They have some automatic devices but not this particular type.

The VICE CHAIRMAN. I don't want to pursue it to the point of becoming tedious but isn't it a fact that these automatic appliances with regard to trains, which I have seen operate, did considerably reduce the number of people who were required to stop moving trains?

Dr. BUSH. Yes, sir; and if the railroads of this country had had their own great research laboratories, had participated completely in the technical advance, had produced 10 or 15 years ago streamlined trains, light cars, many of the things that we see just over the horizon now, the situation in the railroads would be a much more pleasant one than at the present time. In my opinion the railroads have suffered not from the advent of new devices, not from the advent of inventions, but from the lack of completely successful development technically.

The VICE CHAIRMAN. Well, that is compared with the automobiles and traffic of that sort. It didn't result in many people riding trains that hadn't ridden them before, do you suppose?

Dr. BUSH. Well, every time I have been on a streamlined train it has been crowded.

The VICE CHAIRMAN. Now, do you think those people wouldn't have been going places if they hadn't had a streamlined train?

Dr. BUSH. They might have gone another way.

The VICE CHAIRMAN. That has been bothering me, but nobody agrees with me, so don't be disturbed. I have been trying to figure out whether it is a good thing to keep on increasing the number of unemployed people by increasing patents.

Dr. BUSH. You haven't any doubt what I think about it, have you, sir?

The VICE CHAIRMAN. No, sir. Thank you very much.

PROPOSED SINGLE COURT OF PATENT APPEALS ¹

Mr. DAVIS. Mr. Bush, I am very much interested in the proposal with respect to the single court of patent appeals. I should like to ask whether this recommendation made by your committee contemplated that all of the evidence for consideration by the Court of Appeals would be made up in the hearings in the Patent Office, so that the Court of Appeals would in fact be a Court of Appeals and hear the case upon the written record and in the absence of the introduction of any witnesses or additional testimony.

Dr. BUSH. My committee, sir, does not make any recommendation in regard to the distribution of function between the courts of first instance and the Court of Appeals. The recommendation of my committee was directed to one point only, the creation of a single court of appeals for patent cases rather than to have the appeals go to the several circuit courts.

Mr. DAVIS. Was there any contemplation of your committee to the effect that the entire hearings should be here in Washington, assuming that the court of appeals would sit here, or that you would employ trial examiners, such as do some of our commissions, to go to different sections to receive testimony?

¹ This subject is resumed from p. 902 and is continued on p. 1104, *infra*.

Dr. BUSH. The committee suggested that there be held sessions in the several districts but made it clear that that was not the important feature in the minds of the committee; the important feature was the creation of a single court and the details of the ways in which it held its sessions were regarded as secondary.

Mr. DAVIS. You have in my opinion very properly manifested a concern for the inventor, the independent inventor without very great means. If he resides a considerable distance from the capital and was required to bring his witnesses and other testimony to the capital for introduction before this court, would it not in a great many instances amount to a denial of justice to him?

Dr. BUSH. If it would, sir, then we have a denial of justice in the same sense at the present time, for he may be called upon to go to any circuit in defense of his rights.

Mr. DAVIS. Well, but we are undertaking to devise means of improving this situation, not simply creating something else as bad, and I respectfully suggest that that is a very important feature that should be considered, the disadvantages of which could be avoided in the manner of some of the existing commissions.

Dr. BUSH. You also made some comments with respect to the relative position or importance of independent inventors and collective invention, and I presume that by the latter term you refer to the development of inventions in laboratories. That is correct, is it not?

Dr. BUSH. Yes.

Mr. DAVIS. It is a fact, is it not, that a large percentage of the useful, valuable inventions have been developed by individual inventors?

Dr. BUSH. It is a fact that important inventions have come from both sources; yes, sir.

Mr. DAVIS. Is it not a further fact that the success of a laboratory of this kind in large measure depends upon the personnel, with respect to ability and inventive genius of it?

Dr. BUSH. Oh, yes; very much so.

Mr. DAVIS. In other words, can it not be truthfully said that inventors are born rather than made? I mean, men with inventive minds and the ability to evolve these ideas.

Dr. BUSH. While it is quite true that there are born inventors, it is also entirely possible to teach the art of invention to a considerable degree, and a man who is naturally of the type of mind who would make inventions if properly handled in his training will become a much better inventor than if he went his own way. I think it is entirely possible to impart some of the fundamentals of the art of inventing.

Mr. DAVIS. That is all.

Mr. FRANK. Dr. Bush, you referred some time ago to the desirability of removing impediments to the investment in risky ventures which may turn out to be socially useful. Did you imply that perhaps in connection with inventions and investments therein it might be worth while to consider granting some kind of limited tax exemptions to persons making such investments?

Dr. BUSH. That is one artifice that is very attractive as it is viewed in the broad. I would not venture an opinion as to just how such a thing could be worked out, but it certainly seems to me fundamentally

necessary that we make it possible for speculative investment, properly made, to secure a speculative profit.

The VICE CHAIRMAN. Are there other questions?

Mr. DIENNER. I have no further questions. Senator King would like to put some questions to the witness.

Mr. PATTERSON. Mr. Chairman, I should like permission to call on my colleague, the Commissioner of Patents, to speak for a moment on Judge Davis' observation of the court problem. The Commissioner has something in mind, if it is agreeable.

Mr. CONWAY P. COE. Mr. Chairman, I think in a very simple way I can remove some of the uncertainty that seems to have arisen in Judge Davis' mind about the single patent court of appeals. It is contemplated that if that court is established it will be used merely for purposes of litigation and have nothing to do with the appeals from the Patent Office, so that if such a court is established the procedure will be this: A patentee would go into the district court, anywhere he could obtain service on the defendant, and build his record exactly as he does today. Thereafter, instead of appealing to a circuit court of appeals of that circuit, he would take it to this single circuit court of patent appeals, having jurisdiction throughout the United States.

(Senator O'Mahoney resumed the Chair.)

Mr. DAVIS. In other words, you only contemplate appeals from the United States district courts.

Mr. COE. Exactly.

Mr. DAVIS. To be heard upon a written record, a transcript of the record made up in that court.

Mr. COE. Yes; the record made in the district court.

Mr. DAVIS. I misconceived, largely by reason of what Dr. Bush said, the function of the proposed court.

CHARGE OF SUPPRESSION OF PATENTS OFTEN UNFOUNDED

Representative REECE. Mr. Chairman, sometimes one hears the view expressed that the putting of a patent into production is restrained by purchase or otherwise of some interest that would be adversely affected by the patent being put into production, and then after this interest acquires the control or influence over the patent, does not utilize it, and I am wondering if, in your studies, which of course are impartial, such a condition was found to exist to any considerable degree, if at all.

Dr. BUSH. I said a word or two this morning on the matter of suppressed patents, which I think is what you have in mind.

Representative REECE. That is certainly one phase of the question of suppressed patents.

Dr. BUSH. And, I said that in my opinion it did not constitute a serious problem, for various reasons that I outlined, and specifically that in the usual sense of the suppressed patent, namely one that might result in a device for the public benefit, I had never in my experience seen one held away from the public permanently which could produce a benefit.

Representative REECE. As an illustration of what I had in mind, an experience was encountered yesterday as I came down in a taxicab. In some way the conversation with the driver developed which gave

him the opportunity to express his view that he understood there were patents available by which there could be a great saving effected in the use of gas and the operation of an automobile, by which you could get 40 miles to the gallon, but the oil companies had bought them up and of course wouldn't put them into production.

Dr. BUSH. I think that is one of the popular opinions that we are bound to meet. I don't believe myself that there is any serious problem of suppression of patents in this country. I have never seen it.

Representative REECE. My thought in propounding the question wasn't to reveal that I had the view myself, but rather to allay the fears that some might have.

Dr. BUSH. Of course, all inventors think that the things that they invent are great. If they did not have that point of view they would not be good inventors. Very often you find a man who thinks his patent has been sidetracked by artificial means because he knows it is good and knows it would be of great public benefit and it is not in use. For that reason I think we very often find men who have the feeling that they have been artificially prevented from progressing, when really the facts are quite different.

Senator KING. Apropos of that, are you familiar with the Oldfield hearings in the House? ¹

Dr. BUSH. Only very sketchily, sir.

Senator KING. And the McFarlane hearings, recently in the House of Representatives? ² Is it not a fact, especially in the latter hearings, that there was no evidence whatever of any suppression of patents?

Dr. BUSH. I didn't follow that evidence closely, Senator King.

Senator KING. In the Oldfield hearings, two hearings, as I recall, while there was some claim that there had been some patents suppressed or not used, there was no concrete evidence presented, as I recall. Are you familiar with that?

Dr. BUSH. No, I am not. I have never seen the record.

Senator KING. I suppose there are thousands of patents issued which lack utility and are never put into use?

Dr. BUSH. Right.

Senator KING. Have you made an investigation to determine, out of the hundreds of thousands of patents which have been issued, the number which have been used?

Dr. BUSH. No, sir. I thought you were going to ask me whether I had made an invention which proved to have no utility.

Senator KING. I will ask you that now. Out of your 30 patents, how many of them had any utility?

Dr. BUSH. Oh, I suppose half or a third of them are in use. The first invention I ever made was patented in 1913 and didn't have a ghost of a show, but I was too young to know it at the time, or appreciate it.

Senator KING. Taken by and large, you think the patent system has been beneficial to our industrial and economic life?

Dr. BUSH. It has not only been beneficial but it has been one of the essential factors in our position.

¹ Codification of Patent Statutes and their hearings pursuant to H. P. 23417, April 17, 1912; and Oldfield Revision and Codification of Patent Laws, 1914, 63d 2d.

² Hearings before a subcommittee of the House Committee on Patents on "Compulsory Licensing", 75th 3d pursuant to H. R. 9259, H. R. 9815, and H. R. 1666.

Senator KING. Would you favor any repeal or amendment of the present law?

Dr. BUSH. I would not. I would recommend that the patent law be strengthened and its imperfections removed in order that it may function for its intended purpose more efficiently.

The CHAIRMAN. The question propounded by Senator King suggests another one to my mind, namely, did you ever invent any device which was afterwards the subject of litigation, and if so, with whom?

Dr. BUSH. I can't remember of a case where one of my own inventions has specifically gone into litigation.

The CHAIRMAN. You showed us this morning a device which sounded very much like a child's firecracker, but which I think was an important element and a really useful device. Was that ever the subject of litigation?

Dr. BUSH. That device was invented by one John A. Spencer. There are about, I think, 40 or 50 patents in the general field that are held by that company, many of them resulting from his inventions. Those patents have never been the subject of litigations. They have been the subject of long discussion and I can remember a period of years during which we in the company felt that a large company was infringing those patents. The matter never went to suit.

The CHAIRMAN. You say a large company?

Dr. BUSH. A very large company. The matter never went to suit. The company finally took a license, and is now manufacturing under the patents.

The CHAIRMAN. I hope you are now getting a little royalty from the large company.

Dr. BUSH. Yes; we got royalties from the large company for years. We plowed them back in the business; we built up a very fine business, and the depression came along, and things haven't been as nice since, but we still have hopes.

The CHAIRMAN. I have no doubt but that with your personality you could persuade any company to be interested.

FOREIGN PATENTS ¹

Senator KING. Reference was made before the recess to foreign patents. Are there many American citizens who have taken out foreign patents?

Dr. BUSH. I can't give you the statistics off-hand. Yes; quite a number, of course.

Senator KING. Have they encountered any difficulties in the utilization of their patents in foreign countries?

Dr. BUSH. Well, again, from my own experience, the tax situation in foreign countries is very difficult, and the expense of keeping up a group of patents is so high that I do not personally believe it pays to take out foreign patents except under very extraordinary circumstances.

Senator KING. I understood you to answer Senator O'Mahoney this morning that you did not know of any foreign patents taken out in the United States; that is, taken out in the United States by foreigners, which were used for monopolistic purposes, or for the purpose of interfering or injuring the economics of our country, our business life.

¹ This subject is resumed from p. 993.

Dr. BUSH. I said, I think, I couldn't name any specific instance of where I felt that such a situation was permanently disadvantageous. I have no doubt that there are situations of that sort, but I can't name them.

Senator KING. Is there any considerable number of foreign patents?

Dr. BUSH. Oh, yes; quite a large number.

Senator KING. In what particular fields, chemistry?

Dr. BUSH. Oh, I think in all fields. You will find United States patents taken out by foreigners and often assigned to foreign concerns in practically all fields.

Senator KING. Many American patents are taken out now on dyes, are they not, or do you rely very largely upon the German patents for our dyes, for the products of coal tars?

Dr. BUSH. Before the war, of course, the whole dye industry, and the development of organic chemistry of dyes, had its center in Germany and was developed there. I think no one questions that at the present time the American chemists are doing fully as good work as is done anywhere in the world in the development of that type of product.

Senator KING. We took over, did we not, all of the German patents, immediately after we entered the war?

Dr. BUSH. Yes; the Alien Property Custodian had those patents and they were turned over to the Chemical Foundation for the United States of America.

The CHAIRMAN. Do any other members of the committee desire to ask Dr. Bush any additional questions? Mr. Dienner, have you anything more?

Mr. DIENNER. Nothing further, thank you.

The CHAIRMAN. Dr. Bush, we are very grateful to you for a very interesting day. Thank you for appearing.

Dr. BUSH. At your service.

The CHAIRMAN. Mr. Dienner, your next witness.

Mr. DIENNER. May we call Dr. W. D. Coolidge to take the stand?

The CHAIRMAN. Dr. Coolidge, do you solemnly swear that the testimony you are about to give in this proceedings will be the truth, the whole truth, and nothing but the truth?

Dr. COOLIDGE. I do.

The CHAIRMAN. You may proceed. Mr. Dienner, will you proceed?

STATEMENT OF DR. WILLIAM D. COOLIDGE, DIRECTOR OF RESEARCH LABORATORY, GENERAL ELECTRIC CO., SCHENECTADY, N. Y.

HISTORY AND DESCRIPTION OF GENERAL ELECTRIC RESEARCH LABORATORY

Mr. DIENNER. Your full name?

Dr. COOLIDGE. William D. Coolidge.

Mr. DIENNER. And your occupation?

Dr. COOLIDGE. I am director of the research laboratory of the General Electric Co.

Mr. DIENNER. Am I correct in understanding that that was the first industrial research laboratory in the United States?

Dr. COOLIDGE. So far as I know; yes, sir.

Mr. DIENNER. That is identified in popular language as the House of Magic; is it not?

Dr. COOLIDGE. Yes.

The CHAIRMAN. This is the successor of Mr. Steinmetz?

Dr. COOLIDGE. You might regard it as such. But it might be interesting for me to say a few words as to how this laboratory happened to be formed.

The CHAIRMAN. I am sure we would be very much interested, Mr. Coolidge.

Dr. COOLIDGE. It was 38 years ago. Mr. E. W. Rice was then in charge of the engineering work of the company, and among his associates he had Professor Elihu Thomson, Dr. Steinmetz, and Mr. A. G. Davis, who was then head of the patent department, and these gentlemen saw clearly that all of the engineering work of the company was based on the facts and principles established by fundamental research. Much of that research work had been done by university professors, and they felt that it might be a very good scheme for us to contribute to that kind of fundamental research, and of course with the utilitarian purpose of establishing new facts and principles on which new jobs for our factories could be created, new devices which would give work to our various factories.

It might be interesting, too, if I go a step further and give you a little picture of what that industrial research laboratory is like. It started with one man—a very small laboratory. Dr. Whitney was then Professor of Chemistry at the Massachusetts Institute of Technology, and it gradually grew. Today there are about 300 people in that laboratory; about 100 of these are research workers and the others are mechanics, glass blowers, and assistants, and clerical help. The research workers are men who for the most part would otherwise be connected with universities if they weren't with us.

The CHAIRMAN. Would it be inappropriate if we would call that the brain trust of the General Electric Co.?

Dr. COOLIDGE. I think a little, because some of our people would feel that there were brains outside of the laboratory. [Laughter.]

Mr. FRANK. To follow in that vein, Doctor, it is possible that some of those men are persons who have never met a pay roll.

Senator KING. Is the inference that a brain truster never did meet a pay roll?

Mr. FRANK. It has been suggested that they have a monopoly of such incapacity.

Senator KING. Well, they have a partial one.

Mr. DIENNER. Dr. Coolidge, you have been so modest that you have not given us a statement of your qualifications and accomplishments, and I would like to have you do so.

Dr. COOLIDGE. Well, I started out to try to be an electrical engineer, and then after graduating from the Institute of Technology I went abroad for study in physics and chemistry, and then came back to this country and remained at the Institute of Technology for 5 years doing research work, and then in 1905 I joined the staff of the research laboratory in Schenectady.

If I may go on and tell you a little more about what that laboratory is like, I have a feeling that while there is no difficulty in finding men who know enough to do research work, it is not so easy to find those

who can make use, good use, of their knowledge, so that I think of our group as a hand-picked group of men who are able to use their scientific knowledge and as men who are capable of cooperating well with one another and with the other men in the General Electric organization. I should have said that Dr. Whitney in starting the laboratory started out with the idea that cooperation was tremendously important, that given two scientists of equal ability, if they would cooperate nicely with one another, their output should be much more than twice that of either of them working alone, that each should contribute a good deal to the work of the other, and I have seen that work out very well. In the 33 years that I have been in that laboratory I have often seen it happen that one man working in a seemingly very remote field from the other makes an important contribution to the work of the other.

The facilities of such a laboratory are, of course, very helpful to the worker in it. I should name, first, the library as the most important aid to his work, and then he has material facilities in his workroom; he has probably hydrogen gas at low pressure, hydrogen gas at high pressure, oxygen gas, compressed air, water, and vacuum, all piped to his room, and then electrical services—a great variety of electrical services.

I might go on a step further and speak of the different kinds of work going on in that laboratory. Remember that the laboratory was established for fundamental research, that is to establish new facts and principles, but it naturally develops that inventions will be made by members of the staff.

The CHAIRMAN. By fundamental research, Dr. Coolidge, I assume you mean unrestricted research unrelated to the particular objectives that the company itself might have in mind at that particular time.

Dr. COOLIDGE. Absolutely unrestricted. We have ordinarily stuck to things in the electrical field, but now that we regard all matter as electrical you see that that gives us a very wide field for our work.

As a rule, the man is working quite on his own, just as much so as he would if he were connected with a university. It is impossible in a large laboratory for any director to direct in any detail the work of the men in the laboratory.

Representative SUMNERS. Doctor, let me ask you, in this laboratory are you seeking to discover natural law and how human beings can work in accord with it?

Dr. COOLIDGE. New facts and new principles in the physical world.

Representative SUMNERS. You say new facts and new principles; you mean they are newly discovered; they have always existed, haven't they?

Dr. COOLIDGE. They may have always existed. If it were cosmic radiation you would say it has always existed, but we have known nothing about it. On the other hand, it might be something which has not always existed, which has been brought into existence. For example, take ductile tungsten, the material from which those lamp filaments are made, the source of light in all of the present-day incandescent lamps. There was never such a thing as ductile tungsten in existence until it was brought into existence in the laboratory. The tungsten which had been made up to that time, metallic tungsten, had been as brittle as glass, but it was possible by work in the laboratory to make it as strong as steel.

Representative SUMNERS. Has that depended upon some natural principle that you had worked in harmony with? You didn't create it, did you?

Dr. COOLIDGE. You may say that it depended upon metallurgical work, but it was a new metallurgical art which was developed.

Senator KING. May I interrupt you there? Take, for instance, the shattering of atoms; perhaps it was never known and it would have been impossible until the concentration of electric energy and such tremendous power, to shatter an atom.

Dr. COOLIDGE. Except that that shattering has been going on all the time on a very large scale due to cosmic radiation, but we haven't known that until recently.

Representative SUMNERS. But without going any further, you didn't invent the power by which it would shatter, did you? You didn't create the power; it was always here. I think I will withdraw the question.

Dr. COOLIDGE. We might invent a machine for producing very high voltage, very high energy particles for doing such atom smashing.

Representative SUMNERS. The practical question to me—I think it is practical—is we don't seem to recognize in our job of trying to operate the machinery of a complex government that there are any natural laws, any principles, anything that we have got to know about and work in accord with; we just go thundering along. You people in your laboratories are trying to discover natural law and how you can work with it.

The CHAIRMAN. It might be proper to remark here that the courts have recognized a distinction between a principle, which Congressman Sumners is now discussing, and a device which makes use of that principle. The principle is not patentable; the device is patentable, and of course it may be that there is a principle in politics. I will discuss that with Congressman Sumners a little later.

Representative SUMNERS. If there is, we are pretty ignorant of it around here.

Dr. COOLIDGE. I appreciate your help, Mr. Chairman.

I might say that all of this work is published, that is, there is no secrecy in that laboratory. Insofar as possible we try to have every member of the staff know what every other member is doing, and, as I say, all of the results of that research work, which are of any interest, are published, and published very promptly, published just as soon as the patent application can be filed.

The CHAIRMAN. But not published before application is filed.

Dr. COOLIDGE. That is right; provided there is something patentable there. Of course in many cases it is fundamental work, discovery of new facts and principles on which——

The CHAIRMAN (interposing). On which a patent couldn't be obtained.

Dr. COOLIDGE. On which a patent couldn't be obtained. The fact that there is no secrecy is very helpful because it makes it possible for us to discuss our work not only freely among ourselves but also with other research workers in the universities and also in other industrial laboratories, even those of our competitors; that is, we welcome all visitors to our laboratory and always feel perfectly free to discuss anything which either isn't patentable or on which patent protection has been obtained. I have said as much as I have about the value of

cooperation because I know how much more efficient it is to work that way than on the basis of secrecy.

The CHAIRMAN. But this is cooperation within a certain group, as you have just defined it.

Dr. COOLIDGE. It is rather more than that because we do feel that we can cooperate with other groups, with scientists working in other laboratories.

The CHAIRMAN. Yes; you cooperate with these other scientists, these other groups so far as principles are concerned, and new facts are concerned—

Dr. COOLIDGE (interposing). Yes; and often as to methods.

The CHAIRMAN. But you would not cooperate with them with respect to any patentable device until after your application was filed. That is a purely practical situation.

Dr. COOLIDGE. That is correct.

The CHAIRMAN. I was very much interested, Dr. Coolidge, in your description of this laboratory. We all know, of course, that laboratories of this kind are productive of great benefits, public benefits as well as private benefits to your particular corporation. You refer to the advantage which the scientist who is employed by your laboratory derives from the presence, ready to his hand, easily accessible, of hydrogen gas under pressure and hydrogen gas without pressure, the accessibility of current in various forms, and the availability of all of the physical devices which are used in a laboratory. That suggests to my mind an inquiry—if it may be a proper one, and I don't want to ask you to divulge private information—the inquiry as to what your annual budget may be for the maintenance of this laboratory.

Dr. COOLIDGE. In this one laboratory, so-called research laboratory, it will be a little over \$1,000,000 a year, but that will be only a small fraction of the amount of money spent by the company for research. I have no idea what the total amount is, but you see there are some 15 other laboratories. They for the most part are what we call works laboratories, and their function is mainly for testing materials and the control of factory processes.

The CHAIRMAN. Those 15 other laboratories are the laboratories which are operated for the development of devices which are presently usable by the company. I take it.

Dr. COOLIDGE. It is intended that way.

The CHAIRMAN. Yours is the general laboratory which undertake the fundamental research.

Dr. COOLIDGE. Yes; but some fundamental research work will be carried on in these other laboratories. It will depend upon the personnel.

The CHAIRMAN. Would you care to venture any opinion as to the annual cost to the General Electric Co. for maintaining these 15 other laboratories?

Dr. COOLIDGE. I wouldn't dare to. I don't know the answer, and it would be very difficult, I think, even for our controller to tell you how much the company spends annually for research, because in some cases you would need to get together on definitions as to what should be included.

The CHAIRMAN. But in your laboratory the expense is not less than \$1,000,000 a year.

Dr. COOLIDGE. That is right.

The CHAIRMAN. And of course that is made possible only because the General Electric Co. is a large company, with a large number of stockholders and a very large capital reservoir upon which to draw.

Mr. DIENNER. Also you should include the patent system available, in that connection.

The CHAIRMAN. We will come to that, Mr. Dienner. We are not going to forget patents in this inquiry any time.

You were about to answer the question, Dr. Coolidge. I said all of this is possible only because the General Electric Co. has a large number of stockholders and therefore a large capital reservoir upon which to draw to maintain this enterprise.

VALUE OF SCIENTIFIC RESEARCH

Dr. COOLIDGE. That is undoubtedly helpful. I wouldn't want to leave you, however, with the impression that that laboratory is an expense to the General Electric Co.

The CHAIRMAN. Oh, undoubtedly it produces dividends; I am sure of that. I was thinking of the cooperative aspect of the matter to which you have referred.

Dr. COOLIDGE. Yes, sir.

Mr. DIENNER. Might I ask, Dr. Coolidge, whether without such a laboratory your company would continue with development of new ideas, new principles, inventions, and, if so, at what rate?

Dr. COOLIDGE. The engineering development work would certainly go on and the application of known principles, facts, would certainly go on. I think, however, that both of those would go on at a somewhat reduced rate, because without patent protection the manufacturer would spend money on the development of a device and would put it on the market and it would then be copied by others, and the second manufacturer making the "Chinese" copies would have no development expense and so could undersell the first manufacturer who was responsible for the device in the first place.

So far as fundamental research is concerned, I presume we would also do a certain amount of fundamental research, but it seems to me that it would have to be much less than at present, because I don't see how it could be paid for in the absence of any patent protection.

Mr. DIENNER. One other point. Would not the necessity of observing secrecy materially interfere with the rate of advance?

Dr. COOLIDGE. It would certainly slow it down. I was so impressed several years ago seeing how far secrecy could be carried, and how badly it worked out. It was in a German laboratory and the research work was all done behind locked doors, not only outside doors but also inside doors, so that although this was all one laboratory, the man working in this room knew nothing about what was going on in the next room, and it went so far, I remember, in one instance, that the two men working in this room needed an electric furnace of a special type. They knew that a man working in the next room had developed such a furnace, but they couldn't learn anything about the design of that furnace, so they had to go ahead and develop their own, although the same company paid for both of these development jobs.

Mr. DIENNER. Dr. Coolidge, would you tell us about some of the public benefits which have accrued from your laboratory in the past, with reference, for example, to the electric lamp?

Dr. COOLIDGE. As I have already said, the filament, the light-giving filament in the incandescent lamp of today is made of ductile tungsten that was developed in that laboratory. Then most of these lamps are gas-filled lamps and that was also an invention made in our laboratory by Dr. Langmuir, an invention which doubled the efficiency of the incandescent lamp. I mean, the efficiency of the gas-filled lamp is twice that of the high vacuum lamp which preceded it.

I might also speak of our X-ray work; the modern X-ray tube came from that laboratory. To get back a moment to the subject of lighting, the new fluorescent—we have contributed to the new fluorescent lamp which is two or three times as efficient as the gas-filled incandescent lamp.

Mr. DIENNER. Will you pardon my interruption, but I would like to have you bring out at this point what savings were effected to the public through your improvements in lamps over the period of years. Refer to your notes, if you please.

Dr. COOLIDGE. I have a story here which I would like to read on that subject. The United States public paid about \$90,000,000 for the lamps it bought in 1938. If it had to buy the carbon lamps of 1900 to produce the same amount of light, its lamp bill would have been increased by about \$600,000,000 for that one year, \$2,000,000 per working day.

The CHAIRMAN. Well, that of course means that reduction in price is the means by which the inventions of science become available to the masses of the people.

Dr. COOLIDGE. That is right.

Mr. DIENNER. A further point, Senator, that in doing that there is an enormous saving in the cost of current required to produce the light we do get. Not only do we buy more lamps, but we save our natural resources.

Dr. COOLIDGE. That is a small part of the story. The lamps of 1938 through research were so much more efficient than those of 1900 that to produce with the latter lamps the amount of light used in 1938 would have raised the public's electric light bill for the same year by about \$3,000,000,000, or \$10,000,000 per working day.

The CHAIRMAN. It would have been perfectly impossible for the public to have paid any such bill?

[Dr. Coolidge nodded his head.]

The CHAIRMAN. Let the records show that the Doctor nodded his head affirmatively.

Dr. COOLIDGE. Thus research on lamps has given the public an annual saving of about \$3,500,000,000, more than the cost of all the private automobiles sold in 1938 in the United States. But even this is only part of the story. The foregoing was calculated on the basis of average power rates for electric lighting in 1938. The average cost of power today is less than one-third of what it was in 1900, and in this reduction research has played its part. If the light used in 1938 had been produced by the lamps of 1900 with the electric power rates of 1900, the cost would have exceeded that of 1938 by over \$10,000,000,000—\$30,000,000 per day. Of course, the public would get along with less light for they could not have afforded such a lighting bill.

What that would have meant in reduced safety and efficiency in industry, in reduced safety on streets and highways, and reduced comfort and convenience in the home cannot be evaluated in dollars.

The CHAIRMAN. What you are telling us, then, Doctor, if I understand it, is that anything that tends to reduce production or to maintain price is really not in the public interest?

Dr. COOLIDGE. That is correct.

Mr. DIENNER. Dr. Coolidge, would you be good enough to let us in on some of your current work and show us an example or so of what you are working on in your laboratory at present? We would appreciate that very much.

Dr. COOLIDGE. Dr. Bush made it a little easier for me by establishing a precedent this morning of showing some playthings. First of all, I should like to speak of our work on permanent magnets.

The CHAIRMAN. If I may remark, it looks as though Aladdin was just about to rub the lamp.

Mr. DIENNER. It has been rubbed.

Dr. COOLIDGE. Through continuous research, in the last 30 years the strength of a permanent magnet has been increased eight to tenfold. Different groups have contributed to this research, and from our laboratory has come the last step which has resulted in a two or threefold increase in magnet strength. I think that if you try to pull—I won't try to—the iron armature off of that magnet, you will have quite a little respect for it, and I might say that in this magnet, the only permanent magnet part is just the thin outer shell; the rest is of soft iron to concentrate the field in this narrow groove; that is, this was intended for a loud-speaker magnet. [Dr. Coolidge submitted the sample for inspection.]

In this case the magnetic material consists of an alloy of four elements, aluminum, nickel, cobalt, and iron. In the proper proportions and with the right heat treatment, these magnets are sufficiently powerful so that they are capable of producing levitation. You have here such a magnet, and then concealed in the wooden base is another one just like it, and thus, as you see, one is capable of sustaining the other. [Dr. Coolidge submitted the sample for inspection.]

These new magnets will find hundreds of new applications. It is quite interesting to see how the field of usefulness of the permanent magnet is suddenly extended by increasing its strength. It will be used on the airplane, where weight is very important, for the magneto and dynamos and motors; that is, for the fields of dynamos and motors. It will be used where you want a quick break, as in switches where you now use a toggle and spring you will use a little magnet. One of these little horseshoe magnets goes in the control of each of our domestic refrigerators. I will pass these toys around. You might like to put them in your pockets. [Dr. Coolidge submitted the samples for inspection.]

The CHAIRMAN. I think you are trying to interrupt this study, Doctor, by making the members play.

Senator KING. How do you extract the dynamic power that constitutes this magnet; where do you get it? How do you concentrate it in the concrete form? Although it is imponderable, how do you make it ponderable?

Dr. COOLIDGE. What you have done in this case is to take the right elements and then you have put these things in a very strong magnetic field. You have had to do that; that is, the thing is not a permanent magnet until you put it in a strong magnetic field.

I might say just one word more about the magnet research. That material is so hard that it can't be machined; it has to be ground so that the cost, of course, is very important; it has much to do with determining the breadth of the field in which this thing can be used, so that to make little magnets like that or magnets of complicated shape, it is very desirable to be able to get away from the casting process, and we do find here through research that we can take the constituent metals in powder form, mix these powders up in the right proportion, press them in a pill-pressing machine, and then subject them to heat treatment which causes a sintering and an alloying of the metals, and then with the proper heat treatment and after magnetization, they are just as good as cast magnets.

If I may go from that to a more recent piece of work which many of you may have seen described in the public press recently, the work of Dr. Blodgett, Dr. Katharine Blodgett, of our laboratory, in making glass invisible. This has come as the result of several years' work on surface films, fundamental research work, very fundamental on surface chemistry, but she has discovered this application of this work. She has found that by coating glass on both surfaces with a layer of material having the right optical property and the right thickness, she can completely eliminate the reflection which otherwise takes place from a glass surface. That is, when light falls normally on a piece of glass 4 percent of it is reflected at this surface and 4 percent at the other surface so that only 92 percent goes through. This becomes a very serious matter when you come to a complicated optical system such as a good camera lens or a submarine periscope, for example, or a telescope. I happen to remember that in the case of the submarine periscope only something like 20 percent of the light which is received gets down through the instrument to the eye of the observer and that loss, 80 percent, is mainly due to the reflection that takes place from the various air-glass surfaces involved in the various lenses and prisms that go to make up that device.

What I show you here is practical but only in a very limited field, because this film is a soap which would be very easily rubbed off; that is if you touch it you spoil it. It could be used then practically only where it is mechanically protected, but I am rather glad to show it to you for this reason.

The CHAIRMAN. I hope you are not inferring that we ought to make ourselves invisible.

Dr. COOLIDGE. I want to raise this question: Can we afford to carry this invention from this state to the state where it is generally applicable, let's say, on your eyeglasses? That is, now you may be troubled by light coming in from the side and being reflected in the eye from the inner surface of the lens, or on show windows, store windows, or the windshield of your automobile. In all those cases you are troubled by light reflected from the surface of the glass. Now this obviously in its present state can't be used on your windshield because the windshield has to be cleaned. But can we afford to go on with this piece of work, to carry it further, unless we can see a chance to get patent protection on the method which is being developed? Remember that we are not glass manufacturers nor are we manufacturers of optical equipment. I don't see how we can possibly afford to go on further with this invention, how we could possibly do it, unless we could get patent protection on it.

The CHAIRMAN. That, of course, suggests to my mind a very interesting corollary. This invention of Dr. Blodgett for making glass invisible is really outside of the field of General Electric, your immediate field, the field for which that company was originally organized, and in which it is operating, and it is a result of the fundamental study which you have been carrying on. Obviously it is a useful, patentable device, and if Dr. Blodgett applies for a patent the patent will in due course issue to General Electric or its appointee, maybe one of its subsidiaries. That, of course, means, it indicates the way by which, as a result of the studies being carried on in this laboratory, maintained at a cost in excess of a million dollars a year, the General Electric can, in due course, project itself into many fields altogether separate and distinct from that in which it was originally organized. Thereby the patent system and the system of research laboratories would be the means of further concentration in a single company, would it not?

Dr. COOLIDGE. Yes, that is true.

The CHAIRMAN. And that in turn raises the question in my mind whether, under these conditions which you describe, the establishment of research laboratories maintained at such great expense and so perfectly, so completely, it is possible for an inventor, a single individual, to rise in the future, as Thomas Edison arose in the past. In other words, is not the individual now, the natural person who has a scientific turn of mind or a mechanical turn of mind, placed at a tremendous disadvantage to compete with your entire staff, the studies of which are so, what shall I say, stimulated by this tremendous organization that you maintain?

Dr. COOLIDGE. I don't think so. This tree of knowledge is always growing, it is always putting on new branches, so that the frontiers, instead of being reduced, as you may say the geographical frontiers are being greatly reduced—it seems to me the frontiers of scientific knowledge are always being extended.

The CHAIRMAN. Oh, I quite agree with you on that. I didn't mean to imply anything else. I evidently didn't make myself clear. I am asking whether or not in the conditions which you have described the future of invention, the future of discovery, is not being occupied by the collective efforts which are represented by your organization to the disadvantage of the individual enterprise of the individual person.

Dr. COOLIDGE. I personally doubt whether it is to the disadvantage of the individual.

The CHAIRMAN. What chance does an individual have against the General Electric Research Laboratory, your general laboratory and the 15 others?

Dr. COOLIDGE. Take in this case, for example: Dr. Blodgett has made a splendid contribution. This work, you see, is published in detail. She has made a splendid contribution to our knowledge. It opens the field, then, doesn't it, for invention? We will try, of course, to see if we can't get from here to something which is generally applicable, but her publication opens this field up, doesn't it, to the individual inventor as well?

The CHAIRMAN. Yes, but the individual inventor doesn't have available to him in his closet hydrogen gas under pressure, hydrogen gas without pressure, test tubes of every variety, electric power such as General Electric can make available to you and to Dr. Blodgett

and to others. That is what I am thinking of. Here is a collective, cooperative enterprise upon the one hand with these wonderful instrumentalities immediately at command, and here is an individual working without those benefits. Is he not at a great disadvantage, and should anything be done about it? I don't know, I confess.

Representative SUMNERS. Mr. Chairman, isn't this the answer? If the individual could do it, he could do it, and if he couldn't do it, this is the only agency that could do it.

The CHAIRMAN. That may be the answer. We are discussing the fact now.

Dr. COOLIDGE. I think so. We certainly have advantages that he does not, but he is still making useful inventions.

The CHAIRMAN. Oh, yes; and whenever you discover a principle that principle becomes public information and any individual who has the wit and the facility to do so may take advantage. That is true, of course.

Representative SUMNERS. It could hardly be expected that a private person of limited means could take even this glass, with soap on it, and be able to put something on it that would endure, and be able to do anything with it.

Dr. COOLIDGE. I am not so sure, because the principles have been clearly established by Dr. Blodgett. There are two things that are essential, only two things. One is that the thickness of the coating shall be right, one-fourth of the wavelength of the light in question; and the other is that the material used shall be of the right refractive index, that is, that the velocity of light traveling through it shall have the right value. Now, in this case she finds that there is no material—no solid material—which has the right refractive index. But she shows how porosity can be developed in a material so as to give the right refractive index, and shows that that porosity must be of a very fine nature, that is, the air pockets that she develops in this soap film must be so small that they do not cause a scattering of the light.

The CHAIRMAN. To make a film withstand ordinary usage it will become necessary for an inventor or a scientist to make innumerable experiments, just as Dr. Blodgett has made, with all sorts of material under all sorts of conditions, and to do that it is practically necessary for the individual to have at his or her command the vast resources of a laboratory such as yours.

Dr. COOLIDGE. But you would be surprised in this case to see how simple the means are that she has used in producing those films.

The CHAIRMAN. Yes, I judge that; but it took a lot of experimentation under these conditions such as you have described to produce that simple use.

Dr. COOLIDGE. And she certainly has the advantage of close contact with a large cooperating group of scientists.

Mr. Dienner. Mr. Chairman, might I suggest that we will complete that picture a little further, since obviously Dr. Coolidge can not tell the other side of the story so well, and we can call as a witness one or two other men who, without facilities, but who with only the knowledge of principles, were able to perceive how things can be done.

The CHAIRMAN. Mr. Dienner, on behalf of the committee I apologize to you for interrupting. Dr. Coolidge is too interesting, he is too provocative. He gets us going. Proceed, Mr. Dienner.

Mr. DIENNER. The issuance of a patent, Dr. Coolidge, sometimes stimulates other people, does it not?

Dr. COOLIDGE. Yes.

Mr. DIENNER. Explain what you mean by that.

Dr. COOLIDGE. It seems to me that that is very desirable, indeed. I think it often happens that the original invention without improvements would not come into general use, but that the publication through the patent of the basic patent does stimulate others to make detailed inventions, and as a result of such a detailed invention, that may be of benefit to the second inventor and the first inventor, and to the public, where the owner of the basic patent might never have realized at all on his invention.

Mr. DIENNER. We have discussed, for example, the beginning of this film for reducing the glare on glass, and we have been speaking of these high-powered permanent magnets. Take a series of inventions with which you are familiar, and give us some idea of the time between the making of the invention and the putting of that invention into commercial form and into commercial use.

Dr. COOLIDGE. It is very different in different cases. It seems to be always very much longer than one would predict. I have in mind a recent development some 4 years ago, I should say. One of our men invented a new mercury switch, a little thing to be used in the home in place of the ordinary switch that you now have. It was about as large around as a 25-cent piece, and perhaps 3 or 4 times as thick, and there was nothing in it but 2 little steel shells sealed together around the edge with some glass, a little piece of porcelain inside, a drop of mercury and some hydrogen gas. But it has taken us 3 years to get from the idea to something which could be sold to the public. It is a case where the device must be reliable, and it must be very inexpensive. I suppose to have a very wide use, it can't cost but a few cents, so that automatic machinery has been developed to produce it. Automatic machinery has had to be developed to test it, because it isn't sufficient that 99 out of 100 of these devices shall function properly, they must all function properly. But as you look at it now, it doesn't seem possible that it can have taken us 3 years of hard work to get that thing to a point where it could be of benefit to the public.

With more complicated things, the time is usually much longer. Several years ago I remember Dr. Whitney made a study covering a few of the devices developed in our laboratory, and found that the average time was 10 or 12 years.

Mr. DIENNER. Considering the life of the grant, that is the life of a patent after it is granted, have you any comments on the 17 years as being a suitable time or otherwise?

Dr. COOLIDGE. I have a feeling that it is none too long.

Mr. DIENNER. Have you any comments to make on the general character of the workings of the patent system as you have encountered it?

Dr. COOLIDGE. It has certainly seemed to me to be tremendously helpful, and I should certainly hate to see it abolished or any very radical changes made in it. I am impressed, of course, by the fact that under that system in the 38 years since our laboratory was started some 1,500 other industrial research laboratories have sprung up.

MR. FRANK. Dr. Coolidge, your corporation devotes apparently a considerable amount of its funds not only to the development of these ideas, but in many instances to their useful exploitation and development. That indicates, I would gather, that in that manner other than through what are known as the capital markets, large sums of money are available for the development of American enterprise, so that the sole measure of our industrial advancement must not be taken as being found solely in the capital markets.

DR. COOLIDGE. You are getting me a little out of my field; I am sorry.

MR. DIENNER. Do you vision the future as involving a continuous increase in the number of research laboratories maintained by industries?

DR. COOLIDGE. Yes, I do. I think it has been very well demonstrated now that it is only through research that industry can be—well, I think of research as insurance for industry.

MR. DIENNER. Insurance against what risk?

DR. COOLIDGE. Any industry is manufacturing certain things. Improvements may be made by others which would render those things unsalable.

MR. DIENNER. In other words, insurance against a displacement from its position, whatever that may be?

DR. COOLIDGE. Yes, that is what I mean.

MR. DIENNER. What do you vision the effect in the way of public benefit may be, that is regarding the patent system as a means for effecting the greatest good to the public? Do you see any danger to the public arising through the increase in industrial research laboratories?

DR. COOLIDGE. I can't see any. As I have said before, I think of the tree of knowledge as always increasing, always putting out new branches, and I can see no hazard in it.

MR. DIENNER. Mr. Chairman, I have concluded with the witness' examination.

THE CHAIRMAN. You find the patent system beneficial to General Electric or to any other large corporation operating industrially, do you not?

DR. COOLIDGE. Yes, sir.

THE CHAIRMAN. And that, of course, is recognized as a grant from the public, from all the people of the United States, to the corporation.

DR. COOLIDGE. Yes.

THE CHAIRMAN. In other words, I am merely emphasizing the fact that patents are possible only because the Constitution of the United States and the representatives of all of the people assembled in Congress have provided for this protection to inventors, and that protection inures to the benefit of the big as well as to the benefit of the small.

DR. COOLIDGE. Yes.

THE CHAIRMAN. Of course, the question which suggests itself over and over in my mind in connection with every phase of the study in which we are engaged is whether or not there is anything that we should do, anything that we can do, to make it possible for industry to take up the slack in unemployment. We have had a good deal of testimony here today and upon other occasions, and there is a good

deal published in all of the current literature with respect to the increased opportunities for labor which arise as a result of invention, but as I pointed out in questioning Dr. Bush, these new enterprises have been accomplished, strangely enough, by increased unemployment. Do you think of anything that industry can do or that government can do to solve this very, very important question?

Dr. COOLIDGE. Again I am being taken out of my field, Senator.

The CHAIRMAN. You don't see anything in the patent field which would solve it?

Dr. COOLIDGE. No.

The CHAIRMAN. Are you satisfied that the natural individual is sufficiently protected by the present system against competition from huge collective enterprises such as that by which you are employed?

Dr. COOLIDGE. I think so.

The CHAIRMAN. You think he is.

Dr. COOLIDGE. I think so. We are always on the lookout for new inventions (I mean our company is), whether they come from our laboratory or whether they may be from outside.

Mr. DIENNER. Did you hear the testimony this morning¹ about the manner in which an individual is sometimes compelled to, having obtained a patent, go to great expense through a very complicated legal system to maintain his rights?

Dr. COOLIDGE. Yes; and I can see that it would be very nice if that could be simplified.

The CHAIRMAN. But you have nothing of yours to add to that story?

Dr. COOLIDGE. No, sir.

The CHAIRMAN. Are there any other questions to be asked by any other members of the committee? Admiral Peoples? Mr. Frank? Mr. Williams? Judge Davis? Congressman Reece? Commissioner Coe?

Representative REECE. Except, Mr. Chairman, I would be interested to know what policy your company has with reference to making its patents available to the public, particularly those patents which might be evolved in your laboratory which the company itself does not use.

Dr. COOLIDGE. I think that in general it has been the policy of our company to license other companies under such patents.

The CHAIRMAN. Are there any other questions to be asked? If not, Dr. Coolidge, the committee is very much indebted to you for a very interesting afternoon.

Mr. DIENNER, your next witness will be who?

Mr. DIENNER. I shall call Mr. Flanders, of Jones & Lamson, and Mr. Graham of the Motor Improvement Co.

The CHAIRMAN. Will it be convenient for you to begin with them in the morning?

Mr. DIENNER. I would appreciate that.

The CHAIRMAN. If there is no objection, the committee will stand in recess until tomorrow morning at 10 o'clock.

(Whereupon, at 4:15 p. m., a recess was taken until Wednesday, January 18, 1939, at 10 a. m.)

¹ Supra, p. 855 et seq.

INVESTIGATION OF CONCENTRATION OF ECONOMIC POWER

WEDNESDAY, JANUARY 18, 1939

UNITED STATES SENATE,
TEMPORARY NATIONAL ECONOMIC COMMITTEE,
Washington, D. C.

The Temporary National Economic Committee met pursuant to adjournment yesterday, at 10:30 a. m. in the Caucus room of the Senate Office Building, Senator Joseph C. O'Mahoney presiding.

Present: Senator O'Mahoney (chairman); Representative Williams; Messrs. Henderson, Frank, Peoples, Thorp, and Coe.

Present also: Senator Homer T. Bone, of Washington, chairman of the Senate Patents Committee. Counsel: John A. Dienner, special counsel for committee; Justin W. Macklin, First Assistant Commissioner of Patents; Leslie Frazer, Assistant Commissioner of Patents; Henry Van Arsdale, Assistant Commissioner of Patents; Grattan Kerans, administrative assistant to the Commissioner of Patents; George Ramsey, of New York, assistant to Mr. Dienner.

The CHAIRMAN. The committee will now come to order. Mr. Dienner, you are recognized to proceed.

Mr. DIENNER. Yesterday our last witness was a representative of a large industry, of a wide variety of products, fields and interests, with a large research laboratory at his command. Now we are introducing a witness representing a relatively small enterprise which has for a long period maintained its position in industry under the patent laws and without the advantages of a research laboratory.. We call Mr. Ralph E. Flanders. Mr. Flanders, will you be sworn?

The CHAIRMAN. Do you solemnly swear the testimony which you will give in these proceedings will be the truth, the whole truth and nothing but the truth, so help you God?

Mr. FLANDERS. I do.

TESTIMONY OF RALPH E. FLANDERS, PRESIDENT, JONES & LAMSON, SPRINGFIELD, VERMONT

Mr. DIENNER. Mr. Flanders, will you tell us your occupation and connections?

Mr. FLANDERS. I am president of the Jones & Lamson Machine Co., of Springfield, Vt., maker of machine tools. Machine tools are roughly metal working machinery; and I am an inventor and designer as well as having some responsibility for the business management of the company.

Mr. DIENNER. Give us some further facts in regard to your background.

Mr. FLANDERS. Well, I was born up in the country in Vermont, taken as a child down into Rhode Island, served an old-fashioned

apprenticeship to the machinist trade at Brown's shops in Providence, stayed there for 5 years, worked in the drafting room there and in other places for a number of years, roving about; then was associate editor of *Machinery*, a publication dealing with machine tools in New York for 5 years, from 1905 to 1910; then I went from there back to Vermont, to Springfield, where I now live, for work with the machine-tool industries of that town in various connections.

Mr. FRANK. Mr. Flanders, you are one of the co-authors of a recently published important book known as *Toward Full Employment*?¹

Mr. FLANDERS. I am a co-author, sir, of that book.

The CHAIRMAN. You don't object to the adjective, I am sure.

Mr. FLANDERS. It is a much more difficult and praiseworthy task to be a co-author than it is to be an author.

The CHAIRMAN. I thought you meant the word "important."

Mr. FLANDERS. I would rather someone else would use that.

HISTORY OF JONES & LAMSON TOOL COMPANY

Mr. DIENNER. Will you tell us the history of your present company, which I believe is Jones & Lamson Machine Co.?

Mr. FLANDERS. Yes. There are photostats here of a genealogical chart of my company.² One new ancestor has been found since this chart was made. This chart, by the way, is taken from a book by Prof. Joseph W. Roe, then of Yale, Sheffield School, titled "English and American Tool Builders." The line is traced back one generation earlier to Asahel Hubbard, an inventor of Windsor, Vt., who in 1834 was granted a patent, of which photostats are available for a revolving hydraulic engine.³ This patent carries the signatures of President John Quincy Adams (the Adamses were important in those days); Henry Clay, Secretary of State; and William Wirt, Attorney General of the United States. They got on all the names that were available. A patent was a pretty serious thing; it was an outright monopoly without much qualification or subject to much doubt. The fact that Mr. Hubbard was able to get a patent that enabled him to get the backing of a local capitalist to set up a little machine shop in Windsor, and he built these so-called revolving hydraulic engines which were nothing more than an early form of rotary pump, and from that little town way up in the North, far from the centers of urban civilization, salesmen were sent all over this country, and the first public water system of the city of St. Louis had the water pumped by one of these pumps made up in Windsor, Vt., at that time.

I am not going to go into all of this in detail, but I will touch one or two high spots. The next step was when Nikanor Kendall (these names are good—Asahel Hubbard and Nikanor Kendall—they are country boys) married the daughter of Asahel Hubbard. Nikanor Kendall was a gunsmith, had a country gun shop, and made guns by hand. When he married into the family of a man with a machine shop they commenced making guns by machinery instead of by hand, and it was the development of machine tools for making guns which

¹ Co-authors with Mr. Flanders: Henry S. Dennison, Lincoln Filene, Morris E. Leeds, published 1933 by McGraw-Hill Book Co., Inc. Mr. Dennison subsequently testified before the committee, see hearings held May 22, 1939.

² Subsequently entered as "Exhibit No. 208". See *infra*, p. 1149.

³ Subsequently entered as "Exhibit No. 207". See *infra*, facing p. 1149.

has been continued down through to my company to the present day. I just touch one or two of the high spots in that thing.

I notice here on the left the Enfield gun machinery.

Mr. DIENNER. You are referring to the genealogical chart?

Mr. FLANDERS. Of our company; yes. That is the Enfield Arsenal in England, and the machinery for making the Lee-Enfield gun, with which the British fought the Crimean War, was made up in Windsor, Vt. They made such good guns that were exhibited at a royal exhibition in London, that the British Army sent over a buying commission which wound up in Windsor, Vt., and bought machinery for equipping the Enfield Arsenal.

Coming down through, there is another interesting split-off here. You see the Windsor Manufacturing Co., 1865, in the lower middle center, with a line in the left running off to Sullivan Machinery Co. This firm through its history built almost everything imaginable, including in 1865 certain mining and quarrying machinery, and with regard to the line of quarrying machinery there was a patent suit on, and a couple of young fellows in the Windsor Manufacturing Co. thought that they had a scheme for a channeling machine that was better than the one that was held up by the lawsuit, and so they tried to sell the new idea to the people in charge of the firm, didn't succeed in doing it, so they went down to the livery stable, hired a buggy, and the two of them set off for the neighboring town of Claremont, N. H., and on their way they stopped to talk to a well-to-do farmer of Claremont, Deacon Upham, and with him sitting on one side of the flat-top stone wall and they on the other, they spread out their sketches and he financed them to the making of the new channeling machine. That was the beginning of the Sullivan Machinery Co., which is one of the leading builders of mining and quarrying machinery in the United States—another case of the starting of a new industry from the ideas of a couple of young fellows.

Now, this central company has gone into decline two or three periods throughout its history and had to be reorganized, and in each case the reorganization and the new success was built on new inventions and new patented inventions, clear down through to the last one, James Hartness, who came there in 1888 and revived the fading institution with new blood and new ideas, and again brought it to the front.

The last thing I will mention is the three names below Mr. Hartness' name to which a fourth has been added since this chart was made: Mr. Lovejoy. There is a succession of chief draftsmen from Mr. Hartness, each of whom had a patentable idea, each of whom left the parent company, got financial backing for his idea, and each of whom founded a successful company existing and operating today.

This genealogical chart of companies is, if looked at from the patent standpoint, a series of patentable ideas, branching off from the central parent stem and becoming a new and successful and going organization.

Mr. DIENNER. Each enterprise founded on an idea not coming from a research laboratory, I take it.

Mr. FLANDERS. No. In fact, one of the most picturesque of these is Mr. E. R. Fellows, who before he went with Mr. Hartness was a window dresser in a department store in Torrington, Conn. That wasn't a research laboratory proposition.

Mr. DIENNER. Mr. Chairman, may we have these charts introduced in the records as exhibits? I think they would be helpful to explain the testimony of the witness.

The CHAIRMAN. Without objection, so ordered.

(The documents referred to were marked "Exhibits Nos. 207 and 208" and are included in the appendix on pp. 1148-1149.)

VALUE OF PATENT PROTECTION TO INDUSTRY

Mr. DIENNER. Mr. Flanders, in your particular industry what do you feel would happen without patent protection to your company?

Mr. FLANDERS. Without patent protection—really, I can't imagine. It is the patent protection which makes it worth while for us to spend the tens and sometimes hundreds of thousands of dollars involved in developing a new idea. I don't know just what we would do without patent protection. I am sure that there would not be so much improvement because you couldn't afford to put the money into the development. I never tried to think what it would be without patent protection.

Mr. DIENNER. Assume that you even had the disadvantage, or the advantage, of a compulsory license provision in the law, what would be the effect upon your industry?

Mr. FLANDERS. The compulsory license provision—well, of course, most of the patents, not all but most of the patents we take out we put into use, and we wouldn't lose much ourselves that we had patented, but I am not able to answer these hypothetical questions quite so well as I am to describe actual experience. I haven't tried to think through what would happen with a licensing provision.

Mr. DIENNER. In other words, if someone had the right to come to you and ask for a license on the payment of a fee, royalty, you consider that would be beneficial.

Mr. FLANDERS. I see, you are not referring to the same situation they have abroad where you must either work it yourself—

Mr. DIENNER (interposing). No, that is called a working agreement.

Mr. FLANDERS. The idea being if people had a right to demand a license of us?

Mr. DIENNER. Yes.

Mr. FLANDERS. That is different.

Mr. DIENNER. What do you think of it?

Mr. FLANDERS. If they had the right to demand a license, it would depend on what the license fee was. If it was something that required \$100,000, which is by no means, even in our line, a large sum, to develop and get possible future profits from it, we should need to have a license fee large enough to have warranted that expenditure and it would be a pretty large fee.

Mr. DIENNER. Would you like to have some existing with you, even though you did receive a royalty on your own ideas?

Mr. FLANDERS. We might be willing on any particular thing to receive licenses large enough so we could sit back and do nothing on that particular thing, but we wouldn't want to be compelled to sit back and do nothing on everything we did and just receive money without having any fun in business.

I don't know, this proposal is something that I haven't given much thought to. You speak about having competition. We do have very severe competition, and the competition at the present time

works this way, that here is a competitor here, and here are we here, and we find our competitor moving ahead a notch with some new patented improvement, and we have to think hard and think fast and think of something else that is better than that so that we are up here, and the other fellow thinks of something that is better than that and he is up here, and so we keep going. That is as far as I can go right this minute, but there is no end to that step-by-step progress that comes with protected inventions.

The CHAIRMAN. Now are you speaking of actual events which have happened in your experience, or of an ideal condition?

Mr. FLANDERS. Yes; that situation is actual. A particular case of it is at the moment is with a comparatively new machine, a new process, a process for grinding screw threads on hardened parts, particularly useful in aviation engine work. We have one competitor. The competitor (let not this word get out of this room) is just about as good as we are, and we are a continual stimulus to each other. That doesn't trouble us at all, and it is good for the industry as a whole.

The CHAIRMAN. When this very able competitor of yours develops a new device, do you attempt to compete with it by imitating the device or by developing an utterly different device?

Mr. FLANDERS. An utterly different device for the same thing, not by trying to copy at all—an utterly different device, and the net result is that in this particular process the results obtained for the user of the machine are about four or five times as good as they would have been if there had been no competition and no patented protection. The user gets the benefit of it. That is a specific instance. In general, our whole industry's relation to patents and the relation of our customers to the effects of patent protection run along the same line.

The CHAIRMAN. It occurs to me that under the compulsory licensing system, of which Mr. Dienner spoke, it would only be necessary for you, when your competitor stepped out a yard in advance of you, to demand that he license the new device to you and you would not be put to the stimulus or the effort of developing the utterly different device from your own.

Mr. FLANDERS. No; we wouldn't be put to the stimulus; we probably wouldn't make the effort and the art wouldn't be advanced so rapidly. That seems to me a logical result.

I say, this is a hypothetical situation I have never met, but I imagine it would work that way.

Mr. DIENNER. I would like to ask, Mr. Flanders, whether there is any broad patent protection in your specific field that you now know of; I mean, which prevents anyone from making machine tools.

Mr. FLANDERS. No; there is no marked-off space of any importance that I can think of in which there is a "no trespassing" sign set up. It is an old industry and an open field for ingenuity. Its opportunities for ingenuity still exist; ingenuity is still being exercised, still being protected, still being rewarded, and the field is still being developed in spite of the fact that it is an old one.

Mr. DIENNER. You mentioned the products or machines made by your company as a thread-grinding machine. Do you make other machines?

Mr. FLANDERS. Yes; we make turret lathes, automatic lathes, the automatic opening die, and a line of optical measuring instruments

involving the use of magnified projection of outlines to be measured.

Mr. DIENNER. Now I would like to bring before the committee the picture in regard to the expiration of a particular patent and the result of that in connection with the turret lathe. Will you explain the facts in connection with that?

Mr. FLANDERS. Well, the facts in connection with that are typical of almost any of these lines on this chart. The modern turret lathe was born with our company before the Civil War. After the Civil War it went through another period of development on which a series of patents was taken out. On the expiration of those patents they became common property and are now used without thought or knowledge, even, of their ever having been patented, they have become so much the common property of the industry by all builders of turret lathes in the country, and a series of lathe patents in the nineties has become common property and is used by all builders of turret lathes the country over and the world over. In these other companies down here, particularly Fellows, the Gear Shaper Co., gear-cutting machinery, the same thing is true. He developed—this man whose previous experience had been dressing windows in a dry goods store—a method of cutting gear teeth which was new and revolutionary. It is now common property. There are two firms in the United States, two in England, and two in Germany building machinery which is more or less a direct copy of the machines that he built. That has now become the common property of the industry and is the basis of the designs of many companies.

Mr. DIENNER. I take it here is an industry in which a great many devices, machines, are being manufactured in substantially the same from in which they were manufactured before the expiration of the patents. Is that correct?

Mr. FLANDERS. That is particularly true of the gear shaper. In the turret lathe I wouldn't want to say "the same form." The principles have remained the same, but the form has been so much improved that the likeness isn't so obvious as it is in the case of the gear shaper, which is a more unique sort of thing, but the same principles that were patented by early inventors in our company are now universally used in improved forms with no change in principle.

Mr. DIENNER. I understand you do not maintain a research laboratory.

Mr. FLANDERS. No.

Mr. DIENNER. What is the size of your enterprise, approximately?

Mr. FLANDERS. We have in good times about 800 employees and sell three or four millions dollars' worth of machine tools a year.

Mr. DIENNER. How are you able to maintain your position in competition with larger competitors?

Mr. FLANDERS. Well, the difficulty is not so much with larger competitors as it is in our location, 7 miles from a railroad, but we can maintain our position there geographically or competitively only by continuous invention and continuous development.

Mr. DIENNER. Which I assume is patented where possible.

Mr. FLANDERS. It is patented; yes.

The CHAIRMAN. If you don't maintain a research laboratory, how can you depend upon the continuity of invention which you say is so necessary to maintain your competitive position?

Mr. FLANDERS. Continuity of invention is maintained by hiring bright young fellows; it is maintained personally. We have to renew

in a given company without a continuing research laboratory the inventive ability and the personnel at least every generation. That is the history. There is no organization; it is too small for an organization, and it has never been the history of our particular industry to depend on research organizations. Perhaps it is more nearly the old-fashioned inventor than it is scientific research, though a certain degree of scientific research comes into it.

The CHAIRMAN. Doesn't this fall into a slightly different category from that in which the General Electric find themselves, for example? The General Electric Co. is dealing primarily with fundamental research, the application of scientific principles to modern industrial life.

Mr. FLANDERS. Yes.

The CHAIRMAN. On the other hand, your company, which is engaged in the making of machine tools, as I understand it, is dependent rather upon the practical application of particular tools to particular tasks.

Mr. FLANDERS. Yes.

The CHAIRMAN. And therefore you can depend for invention entirely upon these bright young men who are working on a special task every day, and you don't have to have research.

Mr. FLANDERS. That's right; that's right.

The CHAIRMAN. So that the mere fact that your company proceeds without a research laboratory is not in any sense a criticism of the research laboratory method.

Mr. FLANDERS. Not at all; no.

The CHAIRMAN. Nor an indication that the research laboratory method could be dispensed with?

Mr. FLANDERS. Not at all.

The CHAIRMAN. Nor is it an indication that the research laboratory method does not result in the concentration of patent control?

Mr. FLANDERS. Well, does not result in the concentration of patent control. In its own field I presume it does. I like to speak best about my field about which I know.

Mr. DIENNER. Mr. Chairman, I have no further questions for the witness, unless he wishes to develop the subject.

The CHAIRMAN. Mr. Flanders, the fact that your company is primarily interested in the manufacture of machine tools would indicate that you should be particularly expert in giving us an opinion at least with respect to the effect on unemployment of labor-saving devices. I assume that this long line of companies illustrated on the chart which you presented here this morning has grown and extended in the early day to the present time primarily because you have been constantly developing and inventing new devices for making machine tools and for saving labor in the manufacture of the implements to which these machines would apply.

Mr. FLANDERS. In our industry there are two things that improvement does. It provides machines which turn out work faster and turn out work better. You have to keep that in mind particularly in the machine-tool industry, because at least half of the improvement relates to accuracy and the other half relates to higher production. and so setting aside, not forgetting, the fact that a main purpose of improvement lies in accuracy, we will say, yes, that a main line of improvement lies in increasing the output of the worker. Now, this history of our company and its predecessors has gone on for more than

a hundred years, not just since the war, since the World War, but for more than a hundred years it has been engaged in making machinery by which the individual workman turns out more product. Not only has that been true of machine tools; it has been true in textile machinery, it has been true in agricultural machinery, it has been true in every line of production machinery, that for more than a hundred years, not just since 1920, we have been continuously engaged in the process of improving the output of the individual worker.

Now from time to time we run into difficulties, but in that hundred-year period the net result has been beneficial and in the last 10-year period perhaps we are not so clear on the picture; on the hundred-year picture it is clear.

MORE JOBS CREATED THAN DISPLACED BY PATENTED DEVICES

The CHAIRMAN. When you say beneficial, what do you mean in terms of jobs? What I have in mind, Mr. Flanders, simply stating it, is this. Through this hundred-year period—we will treat the 10-year period afterward, as you differentiated it—have your company and its predecessors in machine tools created more jobs than they have displaced?

Mr. FLANDERS. Immensely more.

The CHAIRMAN. Now on what do you base that statement?

Mr. FLANDERS. The industries which have spread out from our work (I don't mean just simply this chart, but the great mass of things that these machines have made) were not in existence; they relate to goods which no one dreamed of; they relate to things like this microphone which no one could even imagine, and the people who make these microphones have completely new jobs. I haven't any statistics at hand, I can't say whether a greater percentage of the population now is gainfully employed than was the case in 1834 when this began, but of this I am sure, that in 1834 they were engaged in making a bare living and in 1939 they are engaged in making for themselves very much more than a bare living, very much more than food and clothes and shelter, and it is the development of which our company has been a part which has made that thing possible.

The CHAIRMAN. Now about the 10-year period which you differentiated a moment ago.

Mr. FLANDERS. The 10-year period seems to me by no means a period in which our distresses have come from labor-saving machinery. Now when I start to talk on this line I am completely off of the patent question, and I don't know whether I should be or not, but we went through in the period from the middle twenties on to the middle thirties a time when the primary activity of a large part of the capital of the country was engaged not in production and distribution, but in the manufacture and sale of paper titles to wealth, and I don't believe that that is a socially useful service. I believe it was at that time a disruptive, socially disruptive occupation, and there is no likeness, no connection between financial speculation and the production and distribution of goods, and I believe we want to be very careful that in applying proper controls and correctives to the production and distribution of securities that we don't at the same time apply improper and dangerous barriers to the production and distribution of goods and services.

The CHAIRMAN. I am afraid I misunderstood you, Mr. Flanders. I thought that you were indicating that in the 10-year period there was a different effect upon employment from that which was noticeable during the previous 100 years.

Mr. FLANDERS. Let me make the connection which I didn't establish. My belief is that there has been no change in the principle, in the effects of the application of improved machinery to employment and production and the standard of living since the war as distinguished from the period before the World War, but that something else has come in which has disturbed us and that that is the cause of our difficulties and that we are not looking at the right thing when we try to find that cause in improved machinery, we are not looking at the right thing, we should be looking at this other thing.

The CHAIRMAN. Then you really mean that the difference in the 10-year period from the 100-year period is due to other causes altogether?

Mr. FLANDERS. Yes; that is it, other causes altogether.

The CHAIRMAN. Do you export any of your machine tools?

Mr. FLANDERS. We exported last year about 60 percent of our machine tools.

The CHAIRMAN. Where did they go?

Mr. FLANDERS. They went largely to England, Russia, and France.

The CHAIRMAN. Was there any difference noticeable in the amount of exportation to those three countries recently?

Mr. FLANDERS. They were largely concerned with war preparations. The domestic demand is not good.

The CHAIRMAN. How about France?

Mr. FLANDERS. France is interesting. France has been a poor market for modern production machinery until this last year. Then the shorter hours introduced by the Premier—you know, previous to Daladier—

The CHAIRMAN (interposing). Premier Blum.

Mr. FLANDERS. Introduced under Premier Blum stopped off or interfered with production, particularly war preparations, to such an extent that for the first time the French are keenly interested in production machinery, and they are now buying it. That is just a matter of interest.

The CHAIRMAN. I was going to ask just another question. With respect to the stability of employment which is available to workers in a field like yours or in a plant like yours which is located in the country, what happens to your workers when a depression comes and your market falls off?

Mr. FLANDERS. We are favorably located so far as the workers are concerned. Our industry is the worst in the whole list of industries for which records are kept. In the 1929 depression there was only one subject to more fluctuations than ours, and that was locomotive building, in which, owing to certain technical corrections in the index they had a minus production one month. Ours wasn't quite so bad as that. On the face of it, it looks as if somebody shipped a locomotive back to Baldwin. [Laughter.] But except for that we have the worst ups and downs of any industry. Located as we are, in the country, a very large proportion of our men have gardens and hens and some of them have cows, some of them have pretty nearly full-fledged farms. Most of them have fathers and mothers or uncles and aunts

or brothers and sisters on the farm, and that helps out during hard times. But there is one other thing that we do, and did. We were enabled in 1929, under the—if you will permit me to say so—tax laws then existing, to lay by a considerable sum for development work, and that development work we carried out during the depression and we spent something between five and six hundred thousand dollars; and five and six hundred thousand dollars in development work means that amount of employment, because in development work a comparatively small amount of material is used—it is almost a hundred percent employment—and we used that during the dull times for bringing our line of machinery and product up to date.

So we had the advantage of a war chest—we didn't go out for dividends, we just want to make sure that is clear; we had a little war chest for maintaining employment, and we were in the country and in close connection with the soil and we got by and our men got by better than did many other industries much less subject to fluctuation than ours was, located in urban centers.

The CHAIRMAN. Your men lived on the soil, whereas the laid-off employees in the big city were unable to support themselves.

Mr. FLANDERS. Yes.

The CHAIRMAN. Do any of the members of the committee desire to ask any questions?

NEED FOR MORE EASILY ACCESSIBLE CAPITAL FOR SMALL INDUSTRIES.¹

Mr. FRANK. Mr. Flanders, in this very important book of which you are co-author, there is an intimation that something ought to be done for the relatively small industry—you indicate, I believe, an industry having a size or needing funds in the amount of \$500,000 to \$5,000,000—that something ought to be done for such industries so that they could more readily obtain capital. Would you care to explain that?

Mr. FLANDERS. Anyone wanting more than \$5,000,000 can get it under normal investing conditions; \$1,000,000 is a feasible amount to apply for; \$500,000 is a little bit difficult. Floating a stock issue or a bond issue or getting banking accommodation of long-term nature for less than \$500,000 is something that we are not set-up to do, and it is the company neither very small nor with needs above the \$500,000 or the million line that needs some means of long-time financing not at present available. Now the company within that range hitherto has ordinarily done its financing by saving up during good times a cash surplus and spending it during hard times. That was most difficult to do under the undistributed profits tax as it was—they are somewhat less penalized for it now, but either whether for expansion or for carrying through hard times it is still difficult for the company in the middle range. Now when it comes to expansion that is something else again; 25, 30, 40 years ago it was possible to go out in the region roundabout for anything that looked good and get additional money. It is not so easy now. The S. E. C. process is all to the good—I mean its purposes, and in general in its large results, are desirable. It has handicapped the little local financing which used to be the regular method by which these small and middle-sized companies either were originally started or got their additional

¹ See hearings on this subject, Hearings, Part IX.

capital as they grew. There is a real element of risk involved in it. That element of risk is pretty, pretty large, and it isn't so easy for local folk to take a chance, nor do they want to, in this comparatively small thing, even though they know there is a chance there.

Twenty-five and thirty years ago people were taking chances willingly; it was in the air. There were successes all about of people who had taken chances; there were failures as well, but the spirit of taking a chance was in the air and the financing of most of the small and middle-sized companies was a matter of willingly taking chances. I don't know whether you get what I mean by the spirit of risk and enterprise being in the air or not, but it has gone out of the air now. We don't breathe that air quite as naturally as we did 25 to 30 or 40 years ago. The S. E. C. is partly responsible for it, by putting the finger on the risks and calling attention to them, partly responsible for it by putting a larger financial load on the small industries than on the large.

MR. FRANK. I should like to pursue that with you for a moment. On that latter point you are misinformed. You might be interested to know that aside from the fact that there are certain exemptions for some small issues, what is more important, we have a great number of issues of small character which have been registered with S. E. C. It is true that the cost of registration is relatively larger, but it is fractionally small as compared with the cost of flotation. We have this very large number of registered issues where that expense has been incurred and where the issues have been unsold, so that the lack of salability cannot be ascribed to the cost of registration.

MR. FLANDERS. I don't think I made clear the point I was trying to make. In times past the inventor put his faith in a man. Here is our region up here in the country; here is a group of two or three or four men. The people around about know these men to be men of ingenuity, men of integrity, men of energy, and they have put their faith and their money in a man, and that is quite a different process from the disembodied corporation of unknown personalities of which you judge on the basis of certain certified figures spread out before you.

THE CHAIRMAN. Then I assume that you would be very much inclined to agree with Senator Borah and me that it is of great importance that the corporation laws be so drafted as to make it possible for men to place the same faith in the corporation which they formerly used to place in the man.

MR. FLANDERS. I don't know the mechanism, sir, but on the end I agree with you 100 percent.

THE CHAIRMAN. I am very happy to have you say that.

MR. FRANK. Have you any suggestion, Mr. Flanders, as to how to meet this most important problem of obtaining long-term financing for the small enterprise which, as you say, finds it difficult now to obtain funds for expansion?

MR. FLANDERS. Well, I should dislike to open up too wide one phase of that subject because it is not the subject we are talking about, and that is the necessity for having visible profit coming out of new enterprise to which people can look and see as visible successes of risked money. I am talking about more or less intangible things, but they are real; profit is under a cloud, the success story is unpopular—these are on the intangibles; we need more success stories to revive the spirit of business enterprise, and I want again to draw the distinction between

business enterprise and financial speculation. We are all the time mixing those two things up, and if you who make the laws of the country and we who are engaged in business can each of us in our part do all we can to hamper harmful financial speculation and to leave the road open for enterprise and production and distribution, we are going to make a better business climate in this country for increased employment.

One of the things we sometimes forget is this, that new business enterprise surely provides new employment, it doesn't surely provide profit; profit is its ultimate end, but the thing that is sure is increased employment; the profit may be, it may not be. But every expansion of a business enterprise is an expansion of employment, and it must be a serious matter for us to provide the proper business atmosphere and the proper business weather for business ventures, not financial ventures pure and simple, but business ventures. That is our prime responsibility today.

Now you asked me, I think, a more specific question and I didn't answer it at all but talked about something else. Do you want to ask your question again?

Mr. FRANK. I don't care to press it, I know that you are a very reflective person and this morning you have indicated undue modesty by restricting your remarks to your immediate experiences. I thought perhaps you might make some helpful suggestions as to specific devices by which the small business enterprise which today finds difficulty in obtaining funds for expansion could obtain such funds on a long-term basis.

Mr. FLANDERS. That is a matter which I have been interested in, have made inquiries about at banks and in other ways, not, I will say, for my own company because we have been well treated. When you look at the problem in detail of this company or that company or the other company, the bank's analysis of the problem in the case of a bank with good management, willing to take some risks, which is what a bank must do as well as anybody else (a bank which lends only on safe risks isn't 100 percent safe, isn't performing its function) but the bank's analysis is liable to look to any of us, I think, as thorough and conclusive for that particular instance. Yet after you look at a hundred or a thousand of those particular instances you are still left with the feeling that some function has not been performed. Now that function previously was performed by private lenders who had confidence in men. It was performed in part by the country bank which was halfway between the city bank and the private lender, and the country bank also had confidence in men—I don't mean necessarily the country bank in a small town like mine, but in a small city. Now what we are trying to do is a difficult thing to do; we are trying to say to the lending institution that you must go by rules and not get into trouble by following your individual judgments of men, you must go by rules, and in so doing we have left this middle area unfilled between that which by the rules is a hundred percent safe to do as a bank and that which is unsafe to do.

Now, I don't know how to fill in that gap. I see the gap but I don't know how to fill it in. It used to be filled in by individuals, risk-taking individuals, or by the small bank which took risks which it is now not allowed to take. In there is an unfilled gap, and I haven't any good suggestions to offer this morning as to how to fill that gap, but I know it is there.

The CHAIRMAN. You haven't developed the cause of that gap, have you? You made some reference to rules and regulations.

Mr. FLANDERS. Yes. Well, the cause of that gap is, I think, clear to all of us. There were mistakes made in years past in that gap, and banks failed and rules are made and those rules are being followed, and the rules are pretty stiff because the banks are insured by the Federal Deposit Insurance Corporation. It is necessary to follow rules. The whole thing is safer, the whole banking situation is safer than it ever was, and yet the field for enterprise has been restricted.

The CHAIRMAN. You don't wish us to infer that in your opinion the laws which have made the banking structure more safe have been the cause of this gap?

Mr. FLANDERS. Yes; they have been one of the causes of this gap.

The CHAIRMAN. That is a different matter. You now say one of the causes. That is what I was hoping you would say.

Mr. FLANDERS. You are getting me into territory in which I am not an expert. I am only telling you now what I see as someone off on the sidelines looking into a territory where he doesn't belong, and I think perhaps it might be better to keep me on the stuff I know something about.

The CHAIRMAN. Before we dismiss you from that, I might just ask this one question, whether you think that it would be very far wrong to suggest that one of the primary causes of this gap has been the progressive concentration of control over the industrial system which makes it very difficult for a man to compete with this collective unit of which you were speaking a moment ago. In other words, a small banker in a small town isn't going to finance an enterprise which will compete with a large national corporation as readily as he would have financed an ordinary applicant 25 or 30 years ago.

Mr. FLANDERS. I presume that may be so, Senator O'Mahoney. There have been no cases of that that have come into my experience.

Dr. LUBIN. Mr. Chairman, I would like to ask Mr. Flanders this one question. It has particular bearing upon rules and regulations that have been made to control banking and investment. I wonder how far, in your opinion, the disappearance of this risk-taking spirit which formerly was personified in confidence in individual people—how far that risk-taking spirit has disappeared as the result of the fact that some of these individuals have proven themselves unfit to be trusted. How far has the fact that now the public knows when dishonesty exists, because of these regulations, been a factor?

Mr. FLANDERS. I think if we look back to the times of our childhood, we will remember an immense amount of rascality, if our mind goes that way, which became public. My recollection is that there was just as much of defalcation and dishonesty in the nineties and the early nineteen hundreds as there is today, if anything perhaps a little more of it, and perhaps a little more condoned, but it was not concealed in those days, but the recognition of that thing was a part of the risk. I don't think we are having any worse men in business or any worse things shown up now than we had 30 and 40, 50 years ago. I don't think we are any worse. In fact, I think on the whole we are better, standards are a bit higher.

The CHAIRMAN. Mr. Dienner, I think we have carried Mr. Flanders very far afield from your outline. If there are no other questions, the witness is excused.

Your next witness.

Mr. DIENNER. Mr. Chairman, we shall turn to Mr. Graham, who is president of the Motor Improvements Corporation. Mr. Graham, will you take the stand.

The CHAIRMAN. Mr. Graham, do you solemnly swear the testimony you are about to give in this proceeding shall be the truth, the whole truth and nothing but the truth, so help you God?

Mr. GRAHAM. I do.

**TESTIMONY OF JOHN A. GRAHAM, PRESIDENT, MOTOR
IMPROVEMENTS, INC., NEWARK, N. J.**

Mr. DIENNER. Mr. Graham, I understand you are president of Motor Improvements, Inc.

Mr. GRAHAM. Yes, sir.

Mr. DIENNER. And how long have you been president of that company?

Mr. GRAHAM. Since April 13, 1925.

Mr. DIENNER. Explain what the business of that company is.

FORMATION OF COMPANY TO ESTABLISH NEW INDUSTRY

Mr. GRAHAM. The business of that company—it was originally organized for the purpose of establishing a new industry, oil filters, filtering the oil of an internal combustion engine as the oil circulated. The idea was presented by an inventor who had in a preliminary way conducted experiments that showed him that under certain conditions, he could perform that function, but he hadn't worked it out and hadn't applied it, and he came to a group of men in Newark and New York who became interested in the problem, and in 1923 a company was organized. At that time the filtration of oil which had been tried by several inventors and proven a failure, was accomplished, and it was up to our company first to prove the principle; secondly, to apply it, because when you go to deal with an automobile motor, you find so many variables that what applies to one will not apply to all. So that the work of application before we could go out and attempt to interest the automobile engineer was quite a task and required the expenditure of an immense amount of money.

After the development was proved practical, then the job of introduction came in. The automotive engineers are about the hardest-headed group of engineers that there is in the country, and one of the policies of the automobile maker is not to put an extra nickel in the car until two things can be proven: First, that it will cut down the construction costs of the car; and secondly, it will increase the utility and decrease the upkeep cost on the automobile.

So we had a difficult job in that respect and before those three stages were accomplished, the initial investment in the company had been spent and it was necessary for the original subscribers of stock to invest more money. The company was originally organized for \$400,000 cash, and before I came into the company two series of notes of \$200,000 each had been subscribed for, so that at that time there was an investment of \$800,000 before any money began to come back.

It is a little difficult for me to follow three experts and talk about patents, but one nice thing developed yesterday, that the last pre-

ceding witness proved to be a customer of ours, and in his talk this morning I find another need for our product on that thread-grinding machine.

We have developed our business much beyond the stage at which it was when I came into the company and we are building filters today for all sorts of purposes, even filtering toothpaste, lacquers and all sorts of products of that nature, and the reason I am telling that story at this point is the fact that things happened to us that made it necessary for us to diversify, and while we started in to merchandise a new invention and establish a new industry, we found that we had to go far afield while staying in the filter business, to develop new uses for our product.

I have listened with a great deal of interest to these gentlemen who have preceded me. I am not an engineer, just a common, ordinary businessman, and I want to tell you what our experience has been. We have probably had the opportunity a hundred times during the last year of looking at new inventions. Invariably the developer of an idea does just the same as Mr. Sweetland did in developing the filter idea, and when a company is organized to put that production on the market, you have only got the idea, you have got to work it out, and that takes real money.

Mr. DIENNER. Mr. Graham, may I interrupt to put your name on the record?

Mr. GRAHAM. John A. Graham.

Mr. DIENNER. Now will you proceed with your story of Motor Improvements?

Mr. GRAHAM. May I refer to notes? I have made a running story of our experience and it will be easier for me to cover it in that way.

Mr. Sweetland, as well as being an inventor, was a very capable businessman and when he wrote the agreement under which our company is operating, we paid him \$105,000, and at that time he had no patents issued. His applications were made to the Patent Office in 1920 and the years following. No patent came to issue until July 1926, so that by the allowed claims of the Patent Office we had faith in the product and undertook its development.

I have heard it said that ordinarily the inventor doesn't get much out of the merchandising of the invention. In our case, it has been the reverse, because in the years that we have been operating, after paying \$105,000 we have paid the inventor \$851,000, so that that "poor" inventor got well paid.

In the early days of our experience, naturally our job was to sell the car companies. Chrysler, when that was put on the market in 1924, was equipped with our filter, known under the trade name of Purolator. That happened in 1924. In 1925 Buick, Cadillac, Oakland units of General Motors adopted our filter. Following that, Nash, Studebaker and Peerless, and a lot of cars whose names you would hardly recognize today, adopted the filter as equipment.

The last half of 1925 and the first half of 1926 we got to where we were making money. We established our price based on our ability to build 50,000 filters a month, and at that point we would break even. Beyond that point we would make some profit, we went along and when we took on these bigger production cars, our volume went up and naturally we began to get a little money back. It became necessary for us in that period, due to the fact that automobile produc-

tion is up this month and down next month, to be in position to take care of the peak production, so we had to provide new buildings. We built a building, two stories, 100 by 150 feet, and bought equipment to put us in position to manufacture economically.

PATENT INFRINGEMENT LITIGATION DISCLOSES EVILS IN PRESENT
PATENT SYSTEM

Mr. GRAHAM. In the early part of 1926 a patent infringement occurred and a company started in to build oil filters, appropriating the patent that we had spent so much money in developing. In 1925 and 1926 we had this volume business. In the early part of 1926 this new filter appeared on the market, experimentally, and at the buying season of the year, which is July 1, we had lost Buick, Cadillac, and in November of that year we lost Oakland, and that cut our business more than in half and drove us immediately from an earning company to a heavy losing company. Fortunately for me, I didn't have to go to the public for finance because the original people were thoroughly willing to support the company, and a bond issue was put on the plant and that provided us with enough money to pay for these investments we had made and to give us some working capital, but it increased the investment in that business from \$800,000 to \$1,100,000.

Now in the regular course, when our patents came to issue in July 1926, we started first by notifying the infringer of the infringement, and asked him to desist and account. Failing to do so, in the fall of 1926 suit was started, and a supplemental bill was filed in the spring of 1927. That case took its regular course and it went to the district court in which the ruling was, or the decision, that every claim of every patent was infringed, but the judge declared the patents invalid. We took an appeal to the circuit court of appeals at Cincinnati. That was late 1928. The district court tried the case in April of 1928, and in 1930 that case was argued before the circuit court of appeals. We felt we were in the right and we employed Mr. Charles Evans Hughes and he and Mr. William Houston Kenyon argued our case before the circuit court of appeals.

That case in 1930, I believe it was—no, it was early 1931, was decided and the trial judge was reversed, claiming that two of the five patents were valid. Well, those two patents were the important patents. The defendants petitioned for a new trial and were refused, and then they petitioned the Supreme Court for writ of certiorari and that was refused.

The CHAIRMAN. Who were the parties to this suit?

Mr. GRAHAM. The AC Spark Plug Co., Flint, Mich.

The CHAIRMAN. And your company.

Mr. GRAHAM. And they are a unit of General Motors.

When the Supreme Court refused to take that case under consideration, it was referred back to the trial judge for the issuance of an injunction. We got an injunction I think on the 2d of November 1931, and then that was filed I think on November 14. Immediately the judge ordered an accounting. By reason of the fact that there were so many units of the General Motors interested in the case, the accounting was a very laborious one. They had the AC Spark Plug Co., the Buick, Cadillac, LaSalle, Oakland, and the United Motor Service, all of whom were parties to the case. It took about a year and a quarter for that accounting to be completed.

After that was completed, then it became necessary for us to employ accountants to study that accounting and to recast it, which used up a lot of time because so many of the records required the interviewing of officials and department heads that our recasting of that lasted about a year and a half.

After that recast was filed, another thing we had to do was to employ accountants also to find what our damages were, to make our own calculation of how much we had been damaged. Then we started a series of arguments with the master that had been appointed, and that carried us through another year and a half. The heads of departments had to be called before the master and the points at issue argued, and it usually had to be done under a court order.

So we come up to December 22. The case was completed before the Master, I believe, in the beginning of 1936 and we had expected before the end of that year that we would have the Master's ruling, but unfortunately, on December 22, 1936 he died without leaving any indication as to what his findings or recommendations might have been.

Then we were up against the problem of doing all that work over again, but the judge had compassion and he decided to end the case himself, and in a series of arguments he went down the list, he allowed us this, he denied us that, and he allowed us this and denied the next item, and that took the early part of 1937, and on April 26 he decided that we were entitled to this, not that, and then it was put back to the accountants for both sides to agree upon the computation of the amount due us, and that again was argued, and on October 11, 1937, he gave us a judgment, entered a judgment based on the findings of the two sets of accountants, and that judgment was for \$1,045,000, with a supplemental judgment based on the possibility of tax savings not to exceed \$139,000, so that it made a possible judgment of \$1,184,000. We didn't think that that was a sufficient amount, for the reason that the judge in rendering his decision took the instrument apart. Our patent covered an extended area type of construction, and he took the filter apart and only allowed that portion of their product which could be attributed to the filtering element itself. We contended that the whole item was the patented item, so at that point our regular attorneys recommended to me that they were so close to the forest that they couldn't see the trees, or something to that effect, and wanted me to get other counsel to review the situation. We employed Mr. W. H. Davis, of Penny, Davis, Marvin & Edmonds in New York, and their recommendation was to us that we had a just right, with the expectancy of an increased judgment, to appeal the case. That case was appealed and went back to the circuit court of appeals in Cincinnati, and while the narrative statement was being prepared it consumed almost all of 1938 and fortunately before the end of the year settlement was had by agreement.

That is the story of the infringement, and one of the reasons why I, as a businessman, feel that some action should be had that will make it impossible for a case to stay in court 12 years.

The CHAIRMAN. You regard your company as a small company?

Mr. GRAHAM. Yes, sir.

The CHAIRMAN. Are you now making the filters for General Motors?

Mr. GRAHAM. We have certain units, but we have none of their car accounts.

The CHAIRMAN. Are they using the device which was an alleged infringement of your device now?

Mr. GRAHAM. Not generally.

The CHAIRMAN. They are using a new device?

Mr. GRAHAM. The cars are not equipped with filters.

The CHAIRMAN. I see. I take it from your story that when you got production it was largely by reason of the use of your filter upon the General Motors, and when General Motors began to use the allegedly infringing device, then your volume dropped off and instead of making money you began to lose money and thereupon had to float this bond issue among your own financial backers.

Mr. GRAHAM. True.

The CHAIRMAN. And your struggle from then on took you through the courts for 12 years in order to establish your fundamental right in the patent, and you did that finally only by settlement.

Mr. GRAHAM. That is correct.

Mr. DIENNER. May I ask the witness another question? I believe there was an interference involved in the same proceedings which I think the committee would like to hear about.

Mr. GRAHAM. Naturally when a company undertakes to defend their action they are going to search the world to find anticipation or something in the prior art. In 1918 a man by the name of Cole applied to the Patent Office for a patent covering what he claimed to be the same principle of filtration as was employed by Sweetland. That was 2 years prior to Sweetland's filings. That case was continuously rejected by the Patent Office, and I might say this. I thought the Patent Office acted very unfairly when they allowed six or seven amendments and kept that patent application alive in the Patent Office. When we tried our case we relied on certain claims of the various patents, and claims that we didn't want to rely on weren't used in our prosecution of the case. After the Sweetland patent came to issue in July 1936, one claim, claim 3 of one of the patents, which had not been relied on by us, was picked up verbatim and put in as a single claim in this Cole patent. That was thrown into an interference immediately with Sweetland's issued patent, and our attorneys argued that interference, and it finally went to the Court of Patent Claims.

Mr. DIENNER. Court of Customs and Patent Appeals?

Mr. GRAHAM. That is right. They finally issued that patent to Cole. Prior to the time that that Cole patent came to issue, a unit of General Motors had made an agreement with a man by the name of Dooley who had taken up the Cole invention. My memory is that they paid something like \$41,000 and agreed to pay \$20,000 a year. Immediately after the patent came to issue they started suit against Sweetland and Motor Improvements in the district court. Our attorneys took up the case and asked for its dismissal, based on the fact that Mr. Sweetland was a resident of California and couldn't be served in the district of Delaware. We finally, after going up to the supreme court from the decision of the third circuit in Philadelphia, got the case dismissed as to Sweetland. That is the interference part of it. The infringement part, then, was set down and tried as between Motor Improvements and Dooley Improvements.

I think it was in 1937 that we got a favorable decision declaring the Cole invention purely a paper patent, and therefore invalid.

When we separated the two cases there was an immediate case started in the District of Columbia, because there they could make Sweetland a party. That case—well, I will finish the Delaware case first. An appeal was taken from the judge's decision, but it happened to be taken 1 day too late, therefore the patent was invalid and the case closed. But last spring the District of Columbia case was tried and the judge has not yet handed down the decision. So while we have got rid of the damage case, that case still hangs over our heads and that is where I criticize the Patent Office for allowing a case of that kind to stay alive since 1918 and come up in 1927 to a patent.

Mr. DIENNER. Might I summarize the proceedings this way, that you were forced to bring suit on your own patent. After a great deal of difficulty you secured a favorable decision. Meanwhile you were being attacked in the rear on a patent which was issued on application pending for a long time, having been held by the Patent Office to contain no allowable claim until the Sweetland patent appeared. Then in this old application in the Patent Office the applicant 10 years pending, without anything allowed, copies the claim of the Sweetland patent on which Motor Improvements was building its equipment, and was actually bringing suit against General Motors, and that interference passed through all the stages of an interference up to the Court of Customs and Patent Appeals, and the Cole patent case issued as of an earlier date than the Sweetland patents, so that while Mr. Graham's company was winning on the one hand, it was apparently losing on the other, being stabbed in the back, as he remarked, by this old patent which did not, as was finally held in the courts, contain the invention; and because of this attack in the rear, Mr. Graham's company first was assailed with that patent in the Sixth Circuit Court of Appeals on the accounting; it was assailed in Delaware in the district court, and finally it has been assailed in the District of Columbia. That is a brief outline of the proceedings.

The CHAIRMAN. And to what extent, Mr. Dienner, does the counsel for the Patent Office now desire to criticize the Patent Office in this matter?

Mr. PATTERSON. I didn't hear all of Mr. Graham's interesting discussion of his problem, but it is clear to me that he has in an interesting and clear fashion described one or two of the evils that the Commissioner of Patents is vigorously trying to change and correct, and such testimony as yours, Mr. Graham, is helpful to us. I haven't spoken to him, but I would like to know if Mr. Coe, the Commissioner of Patents, would care to comment on what you said, if that is agreeable with the chairman.

The CHAIRMAN. I take it that the Commissioner of Patents is to reply to the question that I directed to his counsel.

Mr. COE. I won't try to defend that factor, Mr. Chairman, because the Commissioner of Patents and the present administration of the Patent Office has been very much exercised and is trying to correct at least two of the evils pointed out by Mr. Graham: First, the undesirability and the need for correcting the long pendency of applications in the Patent Office. It hasn't been due to the personnel in the Patent Office but rather to a procedure that permits that. And among the recommendations which I offered the other day to this committee was one that would, we think, effectively stop the evil of long pendency of applications. The second vicious practice

referred to by Mr. Graham is the use of an interference procedure by a competitor for the purpose of delaying or harassing an applicant who, in this case at least, has proven that he will ultimately prevail. The purchase of this old application for the purpose of invoking an interference by a competitor who is even at that moment engaged in a suit with Mr. Graham is another problem which the Patent Office thinks should be corrected.

The CHAIRMAN. Then do you wish us to understand, Mr. Commissioner, that there was nothing which the Patent Office could do in this case?

Mr. COE. Nothing, the Patent Office could do at all in that case under present procedure, Mr. Chairman, so the Patent Office is now proposing additional legislation and procedure that will enable us to cope with that situation.

I might give a specific indication or case as to how the Patent Office has been unable to handle this matter of long pendency of applications. A case came to my attention a few years ago which had been pending 11½ years, and I thought that was far too long and indicated to the applicant that the prosecution of that case must be considered closed. The applicant then, with his attorneys, went down to the district court, obtained a mandamus, and the court ordered me to permit the case to continue, and it was 3 years beyond that point, a total life of 14 years, before the patent was issued.

The CHAIRMAN. The rejection of an application does not necessarily end the application?

Mr. COE. Not only that, but we have to reconsider and reconsider and reconsider the rejection until final issue has been reached by the examiner. That opens up a long course of appeals from the examiner to the Board of Appeals and then to the courts, and as Mr. Graham has indicated, that is exactly the course that this case he refers to followed, not being terminated until it received final termination by the Court of Customs and Patent Appeals.

The CHAIRMAN. Do I understand you to say that an application which has been prosecuted before the Patent Office and rejected may thereafter be purchased by a person who is not a party to the original application and by that purchaser amended and carried through these various steps again?

Mr. COE. It is not only possible, Mr. Chairman, but I think the case Mr. Graham has cited indicates how it is put into practice.

Mr. DIENNER. One more question.

The CHAIRMAN. Judge Davis would like to ask a question.

Mr. DAVIS. Commissioner Coe, where it appears to the satisfaction of the Patent Office that an applicant, apparently for the purpose of putting another application in interference, simply copies the claims or part of the claims made in a prior application, is that not pretty strong ground for the officials in the Patent Office practically taking summary action in reaching a decision in that case?

Mr. COE. Of course, if we were aware of the facts as you have stated them, Judge, perhaps the Patent Office might take some action, but this question of the motive, as to why they purchased this case or why they seek an interference, is something we have no manner of ascertaining, and there are frequently very legitimate, proper instances where an applicant must copy claims from an issued patent.

The CHAIRMAN. If you could establish that motive, do you have the power to take summary action?

Mr. COE. No; we do not, sir. We might try to do some things we wouldn't ordinarily do, but I think we would probably be reversed by the courts.

Mr. DAVIS. If you reached a conclusion of that kind, would not that be a very strong reason for expediting that case so as to prevent an improper interference indefinitely, which is apparently the purpose of the applicant who has placed the matter in interference?

Mr. COE. We are instructed to allow an applicant 6 months in which to respond to an office action. When a procedure contemplates a long course of appeals there is no effective way of expediting the application.

Mr. DAVIS. And that is one reason you are recommending that the law be amended so as to shorten those periods?

Mr. COE. It is our considered judgment that the only effective way of stopping the evil of long pendency of applications is to penalize the applicant himself, and if he stays there, to force him to accept a reduced monopoly. We believe that that selfish interest, then, of his getting his case out of the Patent Office, will effectively cure this evil of long pendency.

The CHAIRMAN. Your 20-year recommendation would be the solution?

Mr. COE. In our judgment that is the only effective solution, Mr. Chairman.

Mr. DAVIS. Well, now, right in that connection, can a willful interferer, without meritorious cause, hold it in interference and by filing amendments and things of that kind limit the time of the life of the patent which is ultimately issued to the true inventor?

Mr. COE. Judge Davis, we suggested what we thought is a complete program. We did not contemplate the operation of the 20-year bill with the present interference practice, and therefore we suggested that the interference practice be so changed that there would not be this possibility of retaining an adversary's application in the Patent Office, such as you now suggest.

In other words, the proposal was to have one interference decision by the Examiner of Interferences, and then issue the patent, and we think that that can be done in such a short time that it can be applied along with the 20-year bill without any substantial unfairness.

Mr. DAVIS. In other words, you recognize that danger and are undertaking to provide against it in legislation.

Mr. COE. Yes; interference reform was part of the program we suggested.

Mr. DAVIS. Mr. Graham, can you tell us how much this extended litigation which you have described cost your company in the aggregate.

Mr. GRAHAM. The court costs, attorneys' fees, expert witnesses, and accountants, which were a very heavy part of the expense of this case, cost the company just around \$300,000 over the 12 years.

The CHAIRMAN. Your judgment was in excess of \$1,045,000, with a possible \$139,000 above that, and I assume, of course, you settled for less.

Mr. GRAHAM. We settled for more.

The CHAIRMAN. I think you had pretty good attorneys or a pretty good business man handling the settlement.

Mr. GRAHAM. Both.

I would like to make one correction. I didn't mean to criticize the Patent Office, only as the procedure appeals to me as a layman.

The CHAIRMAN. Mr. Graham, I think the committee understood the tenor of your testimony.

Mr. GRAHAM. The thing that annoyed me was, and Mr. Dienner can bear me out in this, that there was not one allowed claim in all of the rejections of that patent up to the time they appropriated one claim out of the Sweetland patent, and that is what annoyed me.

Mr. DIENNER. Do you think, do you feel, that the award which you have received in this litigation has adequately compensated you and your company for the trials and difficulties and loss of business and general damages which it sustained?

Mr. GRAHAM. Not nearly.

Mr. DIENNER. Wasn't there an unfair competition feature involved in that case?

Mr. GRAHAM. Yes; when the injunction became effective on October 14, 1931, the defendants ceased to build the infringing type of filter and went to building one that we regarded as not good, and we started an action in the courts at Bay City, Mich., charging them with unfair practice. At the same time we filed a case with the Federal Trade Commission here in Washington charging the same features, and the Federal Trade Commission returned our case on account of the fact that we had it in the civil courts, and until we were through there the Federal Trade Commission wouldn't touch it.

Mr. DIENNER. But wasn't it a fact that during a part of that time the defendant, instead of putting an actual device of filtering characteristics on its cars, was putting something which might not even be described as a filter, a dummy box, as it were, to give the appearance of putting on the filter.

Mr. GRAHAM. That's right.

Mr. DIENNER. Have you a chart indicating the progress of your business throughout the period that you have discussed from its start, through the litigation right up to the present?¹

Mr. GRAHAM. Yes; I have.

Mr. DIENNER. And that indicates, as has been stated by a member of the committee, the ups and downs of your company?

Mr. GRAHAM. Here is the chart, Senator, and this is our inception period, back in 1924. That base line in the upper chart is that 51,000 filters a month that would permit us to break even. In 1925 we went up above the line—in 1925 and the first part of 1926—and there is the indication of the severe drop that we took when we lost that business, and it took us until 1928 to get back up above the line, and in this period was where we had to get that additional financing.

Mr. FRANK. May I ask: When you got your settlement did you have to pay an income tax on the amount for the year in which you received that sum, or was it apportioned over the years backward?

Mr. GRAHAM. I think the fair thing, Commissioner, is to put that back over the infringing years.

Mr. FRANK. What did happen in your case?

Mr. GRAHAM. Nothing as yet.

The CHAIRMAN. That is another suit.

Mr. GRAHAM. No; that won't be a suit, it is just negotiation.

¹ Subsequently entered as "Exhibit No. 209" on following page.

Representative REECE. Mr. Chairman, I am rather surprised to hear this instance cited, because I rather got the impression, when representatives of G. M. C. were before the committee, that they never harmed anybody.

Mr. GRAHAM. Well, this is not a case of picking individual companies. This might have happened to any company.

The CHAIRMAN. Mr. Graham has been called for the purpose of illustrating the effect of the present patent system upon this particular industry, and the individual companies were not material to the inquiry, as I understand it.

Mr. DIENNER. That is correct.

The CHAIRMAN. Mr. Coe, you wanted to ask another question.

Mr. COE. Mr. Graham, without regard to the particular defendant in your litigation but in view of your experience with these numerous litigations, would you care to express any opinion as to the handicap a small company or an individual has in conducting patent litigation against a large corporation or an adversary of considerable strength? Do you regard that as an equal conflict?

Mr. GRAHAM. No; very unequal.

Mr. COE. You think the small company is at a decided disadvantage?

Mr. GRAHAM. Very much so. If it hadn't been for the fact that the original investors in our company were people that could enlarge their investment, and if it were not for the fact that they had confidence in the management, our company probably wouldn't be here today.

Mr. COE. In other words, the result of the litigation, even though you might ultimately have prevailed, would have meant failure to the existence of your business.

Mr. GRAHAM. Absolutely.

The CHAIRMAN. Do you regard this instance as in any degree typical of industry today? Have you heard of any other similar instances?

Mr. GRAHAM. Well, I have heard of lots of instances where companies appropriated inventions and the person who first started the invention or started to merchandise the invention wasn't able to stay through to the finish.

Mr. FRANK. Mr. Graham, have you any notion of what the litigation cost the defendants?

Mr. GRAHAM. I should think it was equally heavy.

Mr. FRANK. You think approximately the litigation cost some \$600,000?

Mr. GRAHAM. That is right.

Mr. DIENNER. May this chart be introduced in the record as an exhibit?

The CHAIRMAN. Without objection, it will be so ordered.

(The chart referred to was marked "Exhibit No. 209" and is included in the appendix facing p. 1149.)

The CHAIRMAN. Are there any other questions of Mr. Graham?

Mr. DIENNER. I have no further questions.

The CHAIRMAN. Do any members of the committee desire to ask Mr. Graham any additional questions? Dr. Lubin? Mr. Frank? Mr. Williams? Mr. Davis? Congressman Reece? Then the wit-

ness may be excused, and the committee will stand in recess until 2 o'clock this afternoon.

(The witness, Mr. Graham, was excused.)

(Whereupon, at 12:10 p. m., a recess was taken until 2 p. m. of the same day.)

AFTERNOON SESSION

(The committee reconvened at 2:10 p. m. on the expiration of the recess.)

The CHAIRMAN. The committee will please come to order.

Mr. DIENNER. We will next call Dr. Frank B. Jewett, who is president of the Bell Telephone Laboratories, which is the largest industrial research laboratory in the world. He will explain the operation and purposes of his laboratory in terms of its effect upon the promotion of science and the useful arts in conjunction with the United States patent system.

Dr. Jewett, will you please be sworn?

The CHAIRMAN. Dr. Jewett, do you solemnly swear that the testimony which you are about to give in this proceeding will be the truth, the whole truth and nothing but the truth, so help you God?

Mr. JEWETT. I do.

TESTIMONY OF FRANK B. JEWETT, PRESIDENT OF THE BELL TELEPHONE LABORATORIES, INC., NEW YORK CITY

Mr. DIENNER. Dr. Jewett, will you please give your name and your position with your company?

Dr. JEWETT. Frank B. Jewett, vice president of the American Telephone & Telegraph Co., and president of the Bell Telephone Laboratories.

Mr. DIENNER. Will you please state your qualifications so that the committee will have your background and some idea of the experience which you have had so that we may ask you questions which may be more or less in the nature of your opinion in certain respects?

Dr. JEWETT. I was born and brought up in the Southwest at a time when social insecurity was the order of the day. I got my preliminary training as an engineer in what is now the California Institute of Technology, then Throop Polytechnic Institute, and I went then to the University of Chicago, where I did graduate work in physics and mathematics, and for 2 years was a research assistant to Prof. A. A. Michelson, later a Nobel prize winner in physics, and then I went to Boston as an instructor in the Massachusetts Institute of Technology, and was there at the time, and was an associate, of Dr. Coolidge, who spoke here, who testified here, yesterday, and Whitney, and was there at that period. At that same time, or about the same time, that Whitney and Coolidge went to Schenectady to organize the General Electric research department laboratories, I was asked to go to the American Telephone & Telegraph Co. to do a similar job.

For, as I listened to Dr. Coolidge yesterday, I think essentially the same reasons I accepted that position. I accepted that position although I had never had any intention of going into industrial research work; in fact, in those days none of us were ever trained for

that. Those of us who took advance degrees were scheduled to go either into fundamental science research in universities or into the teaching profession. It so happened that an appealing story was told and also happened that I wanted to get married and needed some money, so here I am, and for 35 years now I have been an employee of the American Telephone & Telegraph Co., always in intimate association with its research and development work and in the main after the first 2 or 3 years, either in responsible charge either of a part of it or for more than half the period in completely responsible charge for the program of research and development work and the expenditures which the Bell System makes in the communications field, so that whatever judgment is passed on the research function of the Bell System is one which I will have to share in and share a large part of, whether it is good, bad, or indifferent. The only exception to that tour of duty of nearly 35 years now (and it wasn't only a minor exception) was the 3 or 4 years that I served as the operating vice president of the Western Electric Co., and while I had general charge of its research and development functions my primary duty was an operating job in those years.

But since about 1922 or 1923 I have been the chief executive officer in charge of that function of the Bell system's business. That you may have a proper background to get some of the answers I may give to questions, since a large part of this testimony, I judge, will at least touch on the patent side of research and development work, I might say that when I entered industrial life from academic circles I was completely opposed to the patent system, patents at least for that class of work. I had grown up in the atmosphere of pure science, and at that time, whatever it may be now, I think it is safe to say that the consensus of opinion of the leaders of science looked upon the patent system and patents as a thing which were well enough, that had their place with regard to mechanics and possibly to engineers and inventors, but had no place whatever in the purview of those who were trained in fundamental science. I know that that is the way my chief, Professor Michelson, felt. He thought that when I entered industrial life, which was a field where patents were a part, I was prostituting my training and my ideals.

I say that because during the years which have followed I have completely reversed the preconceived ideas I had as to the value and necessity of the patent system. I think scientists in general have changed; I doubt if the same atmosphere prevails now that did then, and also because in the process of the change I found myself changing my point of view. In order to know why I was doing that I made it somewhat of a hobby to learn a little something about the patent system, how it came to be, what society organized it for, what they expected to get out of it, and what price they expected to pay for what they got. Now, that is the sort of background of my history which may help you to appraise whatever I may say.

Mr. DIENNER. I think it would be very interesting at this time to have you tell us what you did find out, under your study of the patent system, as to its usefulness, and the way in which it accomplished its purposes.

ORIGIN OF U. S. PATENT SYSTEM

DR. JEWETT. Well, in the course of my examination, of course, I could not help but come back to the acts of Parliament at the time of James I. Of course, I had thought in my ignorance that the inclusion of the patent section in the Constitution and the acts of Congress which followed it was a thing generated by the fathers of the country. When I came to look into it, of course, I found that they were well versed, the colonial people, in the British thing, and the whole history of this patent business went back to that act of Parliament at the time of James I, when the iniquities which had grown up around the grant of royal patents for every sort of thing had become so obnoxious to the people that Parliament at one fell swoop wiped them all out. That was quite conceivable, but the thing that always struck me about it was that in that era of intense dislike which was willing to wipe out the thing that had grown up over hundreds of years, men were wise enough to see that there was one exception to that thing in which the State could well afford to grant certain rights to people who did certain kinds of things, and that was mainly in the field of those who created new and useful things.

They established that at that time and every patent system, so far as I know—of course I am not an historian—which exists in the world is fathered in that act of the British Parliament back at the time of James I.

Now then, I think most people have a misconception as to what the patent system was set up to do and what patents are. In fact, some of the questions and answers which I heard here yesterday led me to feel that even some of the members of the committee may not have in mind what I conceive to be what a patent is. In the first place, some people have the idea that in the exclusive right which is given to the inventor of a new thing by the issuing agency, in our case the Patent Office, he is given a right to do something which he otherwise didn't have the right to do. That is not at all, of course, the case. Anybody has a right to do anything if he thinks about it, unless he is excluded from doing it, and what the patent is is a right for a limited period of time to exclude others from the use of that thing, assuming it is a valid patent.

Now just what was it that the English Parliament sought to do when they established the first British patent system, and what was the situation which they were trying to correct? The thing they were trying to correct was to break down the walls of secrecy, by which process new ideas were kept secret by those who thought of them, and operated in their own behalf, and the reason they wanted to break it down was because any scheme of secrecy as a means of control is necessarily a limited and small thing. You can't have things secret if you have too many people involved in them. You just can't keep it a secret. And Parliament felt in the interests of the nation as a whole that anything that could be done to break down the walls of secrecy was a good thing.

The other thing that they were attempting to do was to act in behalf of the nation as a whole. They wanted to stimulate invention, they wanted to stimulate new ideas, new manufacture, new products, but they wanted to do it for the benefit of the nation. They weren't thinking particularly of the individual himself, but they could only

do it through the individual, and what they did was to offer what was in effect a bribe to the individual by being willing to agree in advance and to pledge the faith of the nation to inventors unknown, even unborn, that if they would do certain things, the nation pledged itself to do certain other things. And that certain other thing which they did was this: What they demanded of the inventor was that he publish forthwith and fully his invention; in other words, that he break down the walls of secrecy and give all and sundry notice of what it was he had done, and in turn for that and on behalf of the interests of the state, the state agreed to constitute his new thing, his brain child, as real property endowed with all the attributes of real property, principal among which was the right to exclude others from its use for a limited period of time, after which it became public property.

I think, as one looks over the history of the growth of industry in England, and particularly in this country and laterally in the other industrial countries, there can be no question that whatever may have been the deficiencies of that concept in its applications in different places at different times, whatever may be its deficiencies at the moment, the over-all effect of the thing as measured from the standpoint of the nation, of society, has been of inestimable value, and, so far as I can see from my observations of it, the fundamental conditions which obtained at the time of James I's Parliament have obtained continuously since, and obtain at the present time unless one is prepared to say—which I am not—that we have so far explored and made use of the unknown of nature that there is no substantial future for development in the years ahead comparable to that which we have had in the past.

ORGANIZATION AND PURPOSE OF BELL LABORATORIES

MR. DIENNER. Dr. Jewett, will you please tell us about your laboratory, the Bell Telephone Laboratory?

DR. JEWETT. As I mentioned a few minutes ago, I was asked to go to the American Co. at about the same time, a year or so after Whitney and Coolidge went up to the General Electric. Of course, I stated that I thought the conditions which originated that request were almost identical with those which Coolidge testified to here yesterday as having been the genesis of the thing at the General Electric, and it seems quite obvious that was so. Whether at that time there were conversations between the people who managed the General Electric Co. and those who managed the Telephone Co. and it was somewhat of a concerted action, of course I don't know and never will know.

The 35 years of course which I have been in the Telephone Co. are half the life of the industry since Alexander Graham Bell made his invention, and it is perfectly clear that at the time what has grown to be this great research organization was started back in 1903 or '04, the industry had outgrown its ability to progress wholly on the basis of random invention which was the basis of its new material in the very early days after Graham Bell, and had also outgrown the second stage in which inventive ability and genius was teamed up with engineering skills, skills of the trained engineer, and had reached a stage in which it was clear that something which had to be done

problems had to be made. Roughly stated, the telephone developers of the early nineteen hundreds, at the break of the century, knew the things that they wanted to do and knew that it should be possible to do those things in the light of known knowledge or easily ascertainable knowledge, but they couldn't do them with the mere random inventive type of stuff, or even with that supplemented by the typical kind of engineering training that you had there; in other words, that they had to bring some way into the picture the same type of mind, trained mind, and the same type of techniques which had developed the fundamental knowledge which they knew had applicability but which they did not know how to apply, and I think that state of affairs pertained in many industries, it certainly pertained in all the electrical fields and most assuredly pertained in the telephone field.

Well, at the time when I went down to join the bunch at 125 Milk Street in Boston, there probably were two or three men who had been trained somewhat as I had been trained, as a fundamental scientist. Some of them, like myself, had had some engineering training. There was, of course, in the central organization of the A. T. & T. Co. and in the organization of the Western Electric Co. as a manufacturing subsidiary, and had been ever since the start, a lot of experimental laboratories, more or less like the laboratories Dr. Coolidge mentioned yesterday, but they were not research laboratories in the ordinary and present-day sense, so that in the 35 years this research and development function has grown in the Bell System from three or four people to many thousand, and of course you made the statement, and it has been made, that this laboratory of which I am the head is the largest industrial research laboratory in the world. Whether that statement is true or not, it is certainly one of the very largest laboratories, and it is unique so far as I know in quite a number of respects. In many respects, of course, it is exactly the same as any other research laboratory in the physical sciences. In other words, it is dealing with fundamental science knowledge in the fields of chemistry, physics, and what have you, in their applicability to useful purposes in a particular sense.

But it is unique in these respects, part of the uniqueness being connected with the uniqueness of the Bell system itself, the telephone business. In most industrial research laboratories the ultimate objective that is sought is the development of a physical thing which is sold to the general consuming public. Without exception, almost, except in our own case, that is the end of the road, and a good piece of work is done when a thoroughly satisfactory article at a thoroughly satisfactory price, a thing which will give satisfaction to the customer, is delivered.

The interest of the producer ceases and determines when the transaction is completed except insofar as he has an interest in the goodwill of his customer.

Now in the Bell system, while our industrial research laboratory operates physically just like any other industrial research laboratory, it has this distinction, that we make substantially nothing to sell. The end product of our work is physical things, but except to a very limited degree those things are things which are used by the operating companies of the Bell system, communications people. They never appear in trade, or practically never appear in trade.

Now at first sight that might appear to have very little bearing on the question of how we conduct our work. Actually it has a vital bearing in this, that since the Bell system is a completely integrated part and since for the last thirty-odd years since society everywhere in the world tried the experiment of running the telephone business on a competitive basis but gave it up everywhere, so that today there is no competition in telephony anywhere in the world in the ordinary competitive sense—since that time the fact that the Bell system is a completely integrated affair in which from the inception of an idea through its development, its manufacture, its installation, its operation, to the end of its life when it goes on the junk heap the whole thing is under a common command, that integration brings in a type of attack in the research laboratory which is fundamentally different from the attack which is made, which we wouldn't make on exactly the same problem if our end product was to be sold in general commerce, because being part of an integrated system the thing that we are really interested in is that this particular thing which is put into service shall have given the service for which it was intended throughout its life until it goes on the junk heap, in the best possible fashion at the least possible total cost. That results more frequently than not in that the first cost of the thing which is produced and put into service may be higher than the first cost would be if it was sold in commerce and be equally good at the start.

Take an example; take this kind of an example. It costs about somewhere over a dollar, I presume, for a maintenance man to go to visit your house to clear up trouble, most trouble on transmitters; I don't know what the figures are, but it certainly would cost at least that much on the average, and a telephone transmitter I suppose should last on the average about 10 years. Well, now, if you can afford during the life of that thing, by spending a dollar on the first cost of the transmitter, to save two or three visits of a maintenance man, you can afford to put in, in an integrated system, more money on your research and development in your first cost phase than you could afford to put in if you were selling that thing in a competitive market and you were interested in giving a perfectly good article but didn't care anything about the maintenance cost, the other fellow is going to bear that, so that has a bearing on how we handle our problems.

I mentioned this sort of thing in the hearing, to one of the members of the committee some time back, and he suggested that that difference which results from a difference in environment was a thing which might be of interest to the committee in appraising this sort of thing.

And it was suggested that I cite the case in question. Well, I am perfectly willing to do it because it is a rather interesting case and what I am going to say is no reflection on anybody else. Vacuum tubes—you will probably talk more about that later—as we all know, have become in the last couple of decades a very important article in the whole electrical thing. Everyone who has a radio set has a vacuum tube; they are extremely important in the telephone business. The average vacuum tube, I presume, of good quality, which is used, would be considered very good quality, would last nearly 1,000 hours of operation and it would, we will say, consume an ampere of current in its filament to heat the filament up.

That is what the telephone repeater tubes 10 or 15 years ago did require and lasted about 1,000 or 1,500 hours and took about an ampere of current. Well, as a result of research, and we had been buying those things from a manufacturer as though we were individuals buying for our radio sets, since the tubes were absolutely satisfactory and had a reasonable length of life, measured by incandescent lamps, and what not, there would have been no particular incentive for that fellow to have improved his product, unless he could either get a bigger sale by that or get a higher price for it. But we had a very great incentive for reducing the annual costs by prolonging the life of the tubes and by reducing the amount of power that they took or consumed. To make a long story short, the end of the road, about 10 or 12 years ago, was a tube which was no better physically than the one preceding it, but instead of having 1,000 or 1,500 hours life it had 50,000 hours life and took half an ampere of current, and cost slightly less. The cost factor didn't make much difference.

Now what is the effect of that? That is a thing which we had a great incentive to do, but which no outsider, even with our facilities, would have had any particular incentive to do for us. I had the figures here a while back and what it amounts to is this. If I should wave a wand tonight over the plant or system of the Bell system and replace all of the vacuum tubes that are in all of these long-distance line circuits with tubes of the vintage which I have mentioned to you of 10 years ago, tomorrow morning the using public would not know the difference, so far as the service is concerned. The service would be just the same as it is now, but it would cost us \$10,000,000 a year for increased power and in reased replacements of these tubes.

I mention that simply because that was suggested, that I do that as an interesting thing, as an illustration of how this thing developed.

THE CHAIRMAN. I wonder if we might clarify that a little bit, Doctor. Do I understand that the Bell telephone system was purchasing from a manufacturer?

DR. JEWETT. No. They always purchased from our own people, always purchased from the Western Electric.

THE CHAIRMAN. The Western Electric was manufacturing the tube which was of the limited length of life?

DR. JEWETT. That is right.

THE CHAIRMAN. And who developed the tube of the longer length of life?

DR. JEWETT. The Bell Telephone Laboratories, and what it actually resulted in, Senator, so far as the end result for the Bell system, is what I have just indicated to you. The effect on the Western Electric, that part of the Bell system, was of course to reduce its manufacturing output over what it would have been. In other words, instead of manufacturing, assuming you did not have any difference in the number of tubes, you reduced the number of tubes to one-fiftieth of what it was before.

THE CHAIRMAN. In other words the system was being supplied by the subsidiary Western Electric with the short-lived tube?

DR. JEWETT. That is right, short lived measured by our present standards.

THE CHAIRMAN. The laboratory pursuing this research had discovered how to make a tube of much longer life to serve the same purpose and because of its longer life——

DR. JEWETT. And much less current capacity.

The CHAIRMAN. Longer life and less current used, and as a result of this discovery the Western Electric substituted the manufacture of the long-life less-powered tube for the other?

Dr. JEWETT. That is right, except insofar as the growth of the system brought about more business, the effect on the Western Electric as a manufacturing concern was to cut down its business. Suppose that there had been no growth in the use of tubes in the system at the time of the substitution. Then instead of having to replace tubes every thousand hours you replaced them only every 50,000 hours.

The CHAIRMAN. You cut down the number of tubes that it was necessary to manufacture for the same amount of business?

Dr. JEWETT. Right.

The CHAIRMAN. But if you allowed the longer life and the lesser amount of power to be reflected in price to your patrons, then in all probability you had a larger demand?

Dr. JEWETT. Unquestionably there was some larger demand because we all know these long-distance rates, which is the service in which most of these tubes are used, like the transcontinental rates, have been—

The CHAIRMAN. Increasing demand.

Dr. JEWETT. I can't tell you what the effect was on the Western Electric Co., but the tendency was one direction, and all I have brought this out for was because one of the members of the committee suggested it was an interesting illustration of how a philosophy affects what you do with the same kind of tools, and it is a type of thing which if we had been a research laboratory, connected with the Western Electric Co., whose sole business was selling the general trade, we would have had no incentive to do that kind of thing.

Mr. PATTERSON. May I interrupt there? Did this tube become generally available?

Dr. JEWETT. It is universally available in the Bell system, and it is, if I am not mistaken, under all licenses we have granted to everybody, useful to anybody. But no ordinary manufacturer who is making his money out of the sale of his products is likely to have the same incentive to go as far as we have in making the things of extremely long life and extremely low current.

Mr. PATTERSON. I can understand why the manufacturer, the Western Electric, would not cut the business down. It seems to me, however, your incentive in increasing the life of this tube from 1,000 to 50,000 hours might very well have been to decrease the rate to your subscribers, which is what you constantly want to do, and are doing. That is the major effort?

Dr. JEWETT. That's right. You see our objective—maybe I ought to state this, although I think you all know it. It is nothing, even though I have been in the business 35 years, that I can take any credit for, because the wise men—let me go back to the early days of this Bell system, because I think it was a most astounding performance that was done, and its fruits are in the fact that it is recognized not only here but throughout the world that the telephone service in the United States is just miles above what it is anywhere else. Nowhere else in the world can you grab a telephone and call San Francisco or Seattle and wait at the telephone. You have to wait a very long time. That is one illustration.

How did that come about? It wasn't just through a chance aggregation of stupidities. It was due to some awfully wise planning, and what is most astounding to me is that some men back in Boston apparently in the 1880's had a concept which has found, outside the Bell system, very little application since. Practically every public utility, including the Post Office of the United States, which requires material things for its operation, is limited to some extent by the physical things which are produced by somebody else. In other words, it is not master of its own house completely. It is true that the customer influences the supplier of these things, but these Johnnies back in Boston in 1880, who may have had the railroads or the Western Union or somebody as their example, came to the conclusion that if they were going to attain their objective, and I will tell you what that objective was in a minute, there was only one way they could do it. The supplier of physical things must be subordinate to the user of those things, and they set up this arrangement which has persisted since 1882, in which the manufacturer, the using utility company, directs and controls the research and development work and directs and controls the physical things which go into his plant. He is master of his own house, and it has led to some very peculiar things.

The Western Electric Co. is one of the three largest electric manufacturing companies in the United States and it is the only great manufacturing company that I know of anywhere in the world that doesn't have an engineering department. It has no engineering department. It doesn't design a single thing that it manufactures.

The CHAIRMAN. Dr. Jewett, I was tremendously interested in that general principle which you say those Johnnies back in Boston developed, the principle which they felt must be followed at any and all events, namely, that the supplier of the usable thing must be subordinate to the user. Did I understand that correctly?

Dr. JEWETT. This is for a public utility that they were talking about. I don't know that they would have carried it to the ordinary affairs of life. I don't know that they would do that.

What was the objective they were trying to reach? Of course they were kind of a Jules Vernes outfit in those days—they must have been—but they were wise Jules Vernes, and you will find what their objective was stated in the charter of the American Telegraph & Telephone Co. It has been oft quoted. They had the vision of anybody anywhere in the United States, on demand being able to be connected to anybody anywhere else, not only in the United States; they mentioned these places—Canada, Mexico, and what not—by wires or other appropriate means whenever they wanted to do it. They made that statement long before they could talk 500 miles.

The CHAIRMAN. I take it that you meant by that statement that those who were planning this development which we now know as the Bell telephone system, world-wide in its aspects, decided at an early date that if their plan, a very widespread plan, were to be carried out effectively, it must be under a system whereby those who were making the plan and carrying out the plan should be in a position to demand the manufacture of the things that they needed.

Dr. JEWETT. Yes, that is quite right.

The CHAIRMAN. And it was for that reason, I suppose, that these planners established the Western Electric Co. as a manufacturing subsidiary of the Bell.

Dr. JEWETT. That's right.

Dr. JEWETT. You are quite right. Let me finish this and then I will tell you an illustration exactly along the lines I think your mind is running. It shows how the thing worked in another situation contrariwise. Their objective was this thing I have indicated to you and that they should provide this service on demand at the lowest possible rate, and by lowest possible rate they meant in every case rates which were low enough so that they imposed no substantial artificial barrier to a free usage of this service, and with safety to the business. Now that has been the objective ever since before I was in the telephone business. It was stated by Gifford down at Dallas many years ago, and it wasn't anything new with Gifford; he was just restating a thing which was old before he and I were born, almost.

Now to give you the illustration of how the thing works contrariwise. One of the things which was done here a good many years ago in the growth of the business was to develop certain kinds of machine switching to take the place of manual switching which had become in the big cities a very difficult thing to do, and because of this centralized, unified thing in the Bell system, and because of this long-range proposition where you finally judge whether a thing is good, bad, or indifferent by the total cost of the time until you put it on the junk heap, certain types of apparatus were developed for the big city areas like New York. The British Post Office came along and they had a similar problem in London. London, a great big city, didn't have as big a telephone development as New York, but it was a big problem and they envisioned what has actually taken place, a big growth in the telephone service in London. They knew of all this work we had done over here, there was no secret about it, and they wanted very much to use that, the engineers in the British post office wanted to use it, but that type of apparatus required extremely expensive tools to stamp out the stuff, so expensive that it only proved out over the less efficient types of things if you could manufacture in large quantities, single manufacture such as we had in the Bell system. They didn't have that in England; they weren't masters of their own house; their business was built to a considerable extent on what they could get from the manufacturers. That isn't saying that the manufacturers didn't try to do what they wanted but there was a division of responsibility there. They were set up on a competitive basis so far as their manufactures were concerned, and it was quite obvious that two or three or four manufacturers could not tool up with these expensive tools to make this limited quantity of stuff and have the post office bear the burden as they would have to bear it, of these duplicate sets of tools. The post office even went so far at that time (the Postmaster General did) as to work out and present to Parliament a scheme which was, in effect, that these several manufacturing companies should realine their business so that one of these companies could be the sole producer of this thing which they wanted to use, and in return for that give up other kinds of things which it had been manufacturing, and Parliament in its wisdom, probably it was all right, refused to do that. The result was that the British Post Office had to put in, in the city of London, a system which they knew was inferior to the one which was available and was in use generally in the United States.

The CHAIRMAN. Well, the sum total is that in the minds of those who have directed and planned the growth of the Bell telephone system, the patenting of devices and manufacturing of devices which are invented and patented is a wholly subordinate thing to the larger concept of the work of the system.

Dr. JEWETT. Absolutely.

The CHAIRMAN. That is to say that the manufacturing of these devices for the return to be derived from them is not the main objective.

PATENTS RESPONSIBLE FOR DEVELOPMENT OF TELEPHONE

Dr. JEWETT. Absolutely not. And as long as you have mentioned patents now, Senator, I will go back and say that the Bell system is somewhat unique in another respect in connection with patenting. It is a type example of rather ancient age now. When was the telephone invented, '76? It is sixty-odd years ago. In its early stages it was completely dependent on patents, that was its lifeblood; it could not have come into being except for the protection which the patent laws of the United States gave. It was a toy; it was looked upon as a toy when it was invented. Some people had some vision and some courage. They were living in an era in which they were not afraid, and they had reason to believe that the patent system as it existed at that time was a stable thing, that it would persist for a number of years, and they risked their money on this thing. I doubt, with that some thing coming into the picture just at this moment, whether the same course could be pursued, but that is because there are a lot of other factors mixed up in it.

As time went on their complete dependence on patents existed for a good time, 10, 15, or 20 years, as is evidenced. Of course I have to get it from the lore of the tribe, I wasn't old enough to know about it, but it is perfectly clear from the record how vital was this patent business to this small industry which has now become vast. It grew from a little bit of a thing. All you have to do is to look at the records of suits and the scraps in the Patent Office to know how vital it was at that time. But as time went on and the business grew bigger, the same thing happened to us that happens to every great industry. While patents are still of very great importance to us, particularly important in stimulating the ideas which come to us from the outside relatively, they become less vital to the business than they were at the start, and in the case of an industry like ours which for quite natural reasons is not subject to competition in the ordinary sense, our interest in patents is largely an interest of freedom to use whatever is best in the business. The result of it is that I think I am safe in saying that not one-hundredth of 1 percent of the research and development work in the Bell Telephone Laboratories, vast as they are, is done with the idea of getting patents. Patents are a pure incident in the business. Our job up there is to solve problems, is to find new and better, more satisfactory ways of doing the kinds of things we are now doing, or doing other kinds of things.

The CHAIRMAN. If you were to adopt a phrase that is in more or less common use when economic systems are discussed would it be proper for me to say that within the Bell telephone system the theory is: patenting and production for use rather than for profit?

Dr. JEWETT. Yes, I think that is quite right.

Mr. PATTERSON. May I go back, Dr. Jewett—

Dr. JEWETT (interposing). Let me add one thing. The thing is so much of an incidence, the patenting business is taken in its stride, that it is a form of publication, it is a form of publication that has to be done under the laws of the land under certain conditions if you are going to carry out the intent of the patent laws, but the darned thing works in our place in such a way that a large part of the research people resent having to spend time in getting the patents. In the first place, they don't want to spend the time on it, and in the second place they don't want to present their work in the stereotyped way that the patent specifications call for.

Mr. PATTERSON. Dr. Jewett, did you give the year the long-life tube came out? If you did, I didn't get it.

Dr. JEWETT. My recollection is that that change was made in 1923, and we are still 15 years afterwards deriving the benefit from it. Of course, I don't want to get into astronomical figures of the kind you got into yesterday, you can build a thing up so that it becomes absurd, but that is an annual saving. In the year 1938, just as I said, if you replace the tubes that are in the sockets of the Bell system in connection with this long-line service in the tubes of the vintage of whatever this was, 1923, there would be no change in the service, the subscriber wouldn't know it, but it would cost \$10,000,000 to do it.

Mr. PATTERSON. I follow that clearly. I have two or three things in my mind. Is it not this tube that your contemporary, Dr. John Carty, gave so much time to, your vice president in charge of engineering?

Dr. JEWETT. This is the vacuum tube, yes.

Mr. PATTERSON. You recall General Carty?

Dr. JEWETT. Oh, absolutely; I was his assistant for many years.

Mr. PATTERSON. Could I use this tube in my radio?

Dr. JEWETT. No.

Mr. PATTERSON. Could I buy it today?

Dr. JEWETT. Not the one I use.

Mr. PATTERSON. The long-life tube?

Dr. JEWETT. I couldn't use it in my radio and I couldn't use it in any radio because it is designed for the particular service of the telephone repeaters, but you could make a tube which you could use in your radio which has the properties of this thing.

Mr. PATTERSON. I could?

Dr. JEWETT. Sure.

Mr. PATTERSON. Is there one on the market?

Dr. JEWETT. Not that I know of.

The CHAIRMAN. Are the qualities which make this new tube patented?

Dr. JEWETT. Sure, and there are plenty of people licensed to make it if they want to make it.

The CHAIRMAN. I think probably I didn't make myself clear. Was the method by which you produced the longer-lived tube requiring less power to operate just a method of manufacturing or was it a particular—

Dr. JEWETT (interposing). No, of course, I haven't looked the thing up and I can't tell you just what happened, but I surmise you would find that there probably were a considerable number of what you might call secondary patents connected with the development

which I have described here. Fundamentally the tube is exactly what was covered by the earlier De Forrest patents; it is a three-member device.

Mr. PATTERSON. Are any other companies making this tube?

Dr. JEWETT. I think the only companies that are making this type of tube—I don't know any in this country that are doing it. I think the International Telephone & Telegraph Co., which operates abroad, and which has rights under our patents, is making this type of tube for service abroad.

Mr. PATTERSON. So far as you know, no other company in this country is making it?

Dr. JEWETT. No, I don't think so. Of course, I am not a tube expert, but I don't know of any tubes on the market which have the coated type of filament which is employed in all our telephone tubes. Most of them are tungsten filament tubes.

Mr. PATTERSON. If I had the proper experience and the financial structure to manufacture these tubes, would you give me a license to manufacture them?

Dr. JEWETT. I think so. I am not in charge of the licensing business of the company, but I know that many licenses have been given. Whether those licenses that have been given are in any way so worded that they couldn't extend to your particular case, I don't know. You would have to inquire, but so far as I know, yes.

Mr. PATTERSON. Do you happen to know, Dr. Jewett, the general policy of Mr. Gifford on that particular point; as to licensing?

Dr. JEWETT. No; I don't.

Mr. PATTERSON. I don't want to press that question.

Dr. JEWETT. To tell the honest truth, I don't think that we have what you would call a fixed policy on the thing, except that our business is the telephone business and our actions in the past have indicated our willingness to grant licenses broadly, and we have granted many of them. I don't see them; you would have to get that from someone else.

Mr. PATTERSON. Don't misunderstand my question; the A. T. & T. like Tiffany to silver, is doing a marvelous job, but the Patent Office is very anxious to get your advice and assistance in a lot of these things and you in particular with two or three other men can be of great service to us. But have you found any trouble in your dealings with the Patent Office? Have things been fairly smooth? Have we delayed you?

Dr. JEWETT. As far as I know, they have been fine, but my business isn't to solicit patents which bring me into contact with the detailed operations of the Patent Office. But I have never heard any complaint of the thing at all and I think that the Patent Office's attitude toward getting their work done promptly and well conforms exactly to what we want to have done. We are as anxious as anybody to get our applications through in the shortest possible time and in the best possible fashion. The thing I deprecate more than anything else as a user of the system is the thing exemplified in the first recommendation of the Patent Committee, of which I was a member, and that is the invalid patent. If I could have my way I would have nothing but valid patents coming out and I would have a good time.

The CHAIRMAN. You are a fundamental scientist, as I understand it.

Dr. JEWETT. Well, I was a practitioner in the field of the fundamental sciences. Now I don't know what I am.

The CHAIRMAN. Your laboratory is somewhat similar to that which was described by Dr. Coolidge yesterday.¹ You conduct your investigations into matters of principle; that is to say into matters of fundamental science, as well as into matters affecting the practical problems which are presented from time to time.

Dr. JEWETT. Yes.

The CHAIRMAN. In other words, your laboratory is not under narrow restrictions from the managers of Bell Telephone to confine its efforts to productive devices alone.

Dr. JEWETT. No; absolutely not, Senator. I am one of the managers of the Bell system. I am one of its officers. I participated in that thing, and it is true, I think, that the field of our interest is narrower than the field of the interest of the General Electric Co., because we are primarily concerned with the communications field. That is one application of electricity. The sky is the limit for them in their interests.

The CHAIRMAN. But in the prosecution of your studies would it be proper for me to infer that it is almost inevitable that you should follow along in much the same channel as that which is pursued by General Electric, and that you both might be developing similar ideas, mostly in competition with one another?

Dr. JEWETT. Frequently we do, insofar as their interest happens to be in our sector. They are more likely to be doing things in our sector than we are in theirs, because their sector has a great big section we are not interested in.

The CHAIRMAN. And that does happen?

Dr. JEWETT. Absolutely, and does with every other laboratory. In fact, a thing as far removed as synthetic organic compounds, which is the business of an outfit like the Du Pont Co. and not primarily an interest of a thing like the Bell Laboratories, we find in conflict there occasionally.

The CHAIRMAN. It was developed yesterday from Dr. Coolidge that discoveries and inventions are made in the General Electric Laboratory which are altogether outside the field in which General Electric was organized to operate. Now that is true of your laboratory too, is it not?

Dr. JEWETT. I think so. I think it is true of every laboratory.

The CHAIRMAN. What happens to the inventions and discoveries of that character which are outside the field of communication? What do you do with those?

Dr. JEWETT. In general, I should say, and here again you would have to go to the people who are actually operating this kind of property, they are licensed to people who are in those fields.

The CHAIRMAN. But you are one of the managers of the company.

Dr. JEWETT. That would be the policy, to make those things available in some way. Take a case that I happen to think of offhand, that I know quite a little bit about, submarine signaling, this protection of ships at sea and that sort of stuff. That is a kind of business that the General Electric or the Western Electric might well be in. It is. Take the Western Electric. It is not very far removed from the kind of stuff that they make for the telephone business, but it is a specialty kind of business. We are not in it. It is a kind of business which is

¹ Supra p. 911 et seq.

so vital but so small that it couldn't very well—I mean, you couldn't do anything with it competitively, particularly a big outfit.

My recollection is that we had a lot of inventions that were in that field, that could be used in that field, that we and, I think, General Electric, too, made available to the Submarine Signal Co. and the United States Navy for their use, gratis or on very reasonable terms.

The CHAIRMAN. How did you make them available?

Dr. JEWETT. By licensing.

The CHAIRMAN. You retain the patent and license for use?

Dr. JEWETT. Yes, because in general, Senator, these patents are not labeled "submarine signaling." They are a thing which has many uses, and you may license a fellow over in this field and you retain the rights over in all the other fields.

The CHAIRMAN. You see, I am impressed with the scope of a great laboratory such as yours and such as the General Electric's, with the practically illimitable scope of it. You are delving into fields of fundamental science, you uncover principles, you might make discoveries that would deal with fields wholly foreign to communication in any form. Now what happens? Does the telephone company, by reason of those discoveries and the patent system, project itself into fields of industry and commerce which are altogether foreign to it?

Dr. JEWETT. In general, not. I think the best answer I can give to the question I think is running through your mind is merely to cite in two or three sectors what the attitude of the Bell system has been in relation to its job as it conceives it. In its own field it is a tremendous organization. It is alleged that it is the biggest corporation in the United States. I don't know whether that is so or not. But 20 years ago the Bell system was engaged in many activities. In the first place, it was engaged in a business in the foreign field. It had manufacturing plants when I was chief engineer of the Western Electric Co. scattered all over the world. We did a jobbing business of general electrical supplies. We used a great many general electrical supplies, lamps and what-not, and we did a jobbing business in the Western Electric Co.

Along comes broadcasting. We don't know what the field of broadcasting is going to be. We have a feeling that whatever it may be; we have played a part in creating the implements by which it comes into being, and there comes this picture of radio broadcasting, looming large on the horizon. We don't know what our place is going to be in that, except we have a feeling that transmission of speech in connection with that is going to be a vital part. We cannot find out what it is, so what do we do? We create an experimental broadcasting station, WEAf. We had one down in Washington, WCAP. Those were experimental things. As soon as we found out what we wanted to know what do we do? We dispose of those things; we dispose of the foreign business. Earlier still there was a time when the Western Electric Co. was a bigger power apparatus manufacturer than the General Electric Co. We had a great factory in Chicago to make power apparatus. Well, it did not fit in with the telephone business and as the telephone business grew and the problem of our own job grew, the whole tendency has been to slough off these things which are extraneous, and in a way I would say that gave the general answer to the question you asked about our attitude toward this licensing business.

Now there come things, and the things which cause us—and I presume everybody else—much difficulty as anything else—these so-called byproduct results of research. You set out to solve this—to go over in this direction, and inevitably, almost, if you do a good job you develop byproduct values out of your work. They may be quite outside the field of your own activity, and in the main at the time may appear to have nothing but potential value. Every invention that I know of that has been made, whether by individuals or in laboratories, at the time, on the date which the Patent Office would take as the time of the invention, the thing is not anything more than an idea.

It requires a large amount of time and money to bring it to fruition. Now we get one of these byproduct things. What are you going to do with it? You cannot throw it out the window. You cannot give it away, without running the risk of your owners saying, "What are you doing? Are you throwing our property away?" You 'don't know what the value of the thing is; you cannot establish the value; cannot get anybody to establish it. So what you frequently have to do, even though you have no intention of going into a type of business, is to go far enough along to develop the thing so that it is a merchantable article.

NUMBER OF PATENTS HELD BY BELL SYSTEM AND THEIR USE

The CHAIRMAN. Could you give us any approximation of the number of patents the Bell system now holds?

Dr. JEWETT. My recollection is that at the time of the F. C. C. investigation there was a check-up made and there were something like, I think, 15,000, most of which are the results of our own work.¹

The CHAIRMAN. And what proportion of those are strictly communication patents?

Dr. JEWETT. Oh, the great—well, strictly communication, you mean, confined so that they have no other use?

The CHAIRMAN. Let me put it in another way. How many of those are byproducts?

Dr. JEWETT. I should say relatively a small number, a few.

The CHAIRMAN. Is the Western Electric your only manufacturing subsidiary?

Dr. JEWETT. It is the only manufacturing subsidiary, yes; but it is not the only manufacturing supply.

The CHAIRMAN. How about the Graybar?

Dr. JEWETT. The Graybar Co. is this jobbing kind of business, once in the Western Electric Co., and in the sloughing-off process, getting rid of that, the Graybar Electric Co. was created, and the employees who had been in this jobbing business really bought the jobbing business from the Western Electric Co. Except insofar as it may still owe something on the purchase price, it has no connection with the Bell system.

The CHAIRMAN. Does the Western Electric Co. now manufacture any of these byproduct devices?

Dr. JEWETT. Yes, some; if you want to call things like artificial larynx, which Dr. Fletcher and his people developed, a medical thing;

¹ Dr. Jewett subsequently informed the committee that, "The number (15,000) which I gave is the total number which we were free to use as of 1934. The number owned as of that date was about 9,500—and naturally this is a number which varies from month to month because of new and expiring patents. As to the others, we held licenses to make and use." See "Exhibit No. 244" entered in the record on February 8, 1939 and included in the appendix on p. 1158.

aids to the hard of hearing; they are not connected with the communication business; audiometers, deaf sets, for which all the aurists have use now. Those things which were developed in our laboratory in our endeavor to study the mechanism of hearing for the purpose of designing better service. They become valuable tools in the medical profession and they are in every hospital and in every aurist's office, every large one. Those, as far as I know, are manufactured by the Western Electric; whether others are licensed to manufacture, I just do not happen to know.

Mr. PATTERSON. Dr. Jewett, is any manufacturer of radio tubes now licensed to use this long-life Bell patent?

Dr. JEWETT. I think so, yes. My recollection is that in the cross-licensing arrangement, with the whole R. C. A.-G. E. group, they have full rights to use them, but it is not commercially to their advantage to do it.

Mr. PATTERSON. It is not commercially?

Dr. JEWETT. I do not see why it would be. If I were in their place I would not.

Mr. PATTERSON. I can see how they sell less tubes, that is true, but was that in the license accompanying the consent decree of 1932?

Dr. JEWETT. I do not know about that.

Mr. PATTERSON. I mean when they were all divorced?

Dr. JEWETT. I do not know about that.

Mr. PATTERSON. Thank you.

Mr. DAVIS. Are any of those long-life tubes available to independent telephone companies, independent of the Bell System?

Dr. JEWETT. Yes, sir. I am not speaking with great certainty, but I think the present arrangements, either directly or indirectly, make practically anything which is necessary in their business available to them, but I do not know of any independent telephone companies that would have any particular use for long-lived or short-lived tubes in their service.

Mr. DAVIS. Is that used only in long-distance telephony?

Dr. JEWETT. Not only in long-distance telephony, but the principal usage for them is in connection with long-distance telephony; that is where primarily they are amplifying devices, and amplifying devices are principally used on longer circuits, and most of these so-called connecting or independent companies are relatively short things. As a matter of fact, I think most of them have their toll service handled by the Bell System except their very local toll system.

Mr. DAVIS. I know that is generally true, but there are some few telephone companies still in existence besides the Bell System?

Dr. JEWETT. Oh, my heavens, yes; a third of the telephones are in the hands of them.

Mr. DAVIS. In line with questions propounded by Commissioner Patterson—I just wonder whether these tubes are available for purchase by those?

Dr. JEWETT. I said to the Senator I am not in charge of the licensing arrangements, but I see a good deal of it, and my recollection is that most of the telephone business of this country, either directly from us or indirectly through the associated companies with which the connection has made available to us, either through right to purchase or lease or rental, whatever you will, anything which is really necessary to give as good grade service to them as to any of our customers.

The CHAIRMAN. Do you have very much competition from independent inventors? Or, let me put it this way; that does not convey the idea I have in mind. Does the Bell system find it necessary or advantageous at any time to adopt patents issued to others?

Dr. JEWETT. Oh, absolutely, ever since I can remember, and now we are continually either buying patents or more frequently in recent years obtaining rights under patents, and increasingly, I think, our tendency has been—unless there is some peculiar reason for doing otherwise—to be content with a nonexclusive license. Really, what we are interested in is freedom to use.

The CHAIRMAN. But that is not what I have in mind at the moment. I am wondering what proportion of the patented devices which the Bell Telephone System uses were developed within your own laboratories and what proportion came from outside.

Dr. JEWETT. A great lot of them came from within the laboratory.

The CHAIRMAN. What percent, would you say?

Dr. JEWETT. What percentage would I say? I would say three-quarters. That is just a guess on my part.

The CHAIRMAN. Not less than three-quarters?

Dr. JEWETT. I would say not less, but that again—I would want to check that, if you want to use it. The great bulk of it.

The CHAIRMAN. Would you think that I would be justified in saying that in large enterprises like the Bell Telephone System and the General Electric, Westinghouse, Radio, and the rest, the research laboratories which are maintained by these corporations produce by far the great majority of the devices which are used?

Dr. JEWETT. I think that is true, if you measure it just in numbers of patents. That partly is an exigency of what patents are. There are many of these 15,000-odd patents that I have mentioned to you which are essentially very trivial things. There are a great many of them which are not in use, and that arises—that is true both with regard to those that originated with us and those that came to us through purchase from the outside. The results from this sort of a thing, whenever a patent on an improved device or method comes out, it automatically makes one or more patents obsolete. They are legally alive, but they are as dead as the Dodo bird.

The CHAIRMAN. I assume you maintain a close scrutiny of the patents which are issued by the Patent Office from time to time?

Dr. JEWETT. Yes; we do, and one of the reasons—sometimes we are interested, Senator—of course more frequently than not the inventor, the owner of the patent on the outside, brings his invention to our attention, as he does to the General Electric or anybody else for purchase or a license under it. If, however, we find something which for one reason or another as it issues from the Patent Office looks of interest to us, then we may be the seeker for that right from the inventor. Very frequently we have this kind of a condition. While we are interested to get rights, even though we have no specific intention to use it at that moment from the standpoint, here is a patent or a group of patents which cover a general field. Now, we are doing something in a field which is right close by there. We get ready to use what we have developed and the question comes up, Are we free to use? Nothing is ever put into the Bell System until it has gone to the patent department for them to answer, to our patent department for them to answer two questions: Is there any-

thing of patentable nature in this which ought to be protected in the United States Patent Office; and second, is there or is there not freedom to use? Do we infringe somebody's else's patents?

Well, if this field of these patents I am talking about is very close to the one you are working in, and it isn't terribly important but you may want to acquire rights in that field for the sheer facility it gives you in not having to make this interminable search through a whole grist of patents, if you know that in this whole field I have freedom to do anything I please and use the best thing there is without further search it is of some convenience to you. That is not a very common case but it does arise.

The CHAIRMAN. One of our witnesses this morning, I think it was, told of the incident in the business in which he is engaged, of competitive effort upon the part of his own company and of another company, and of the effort of each when the other developed a new device, to develop another new device altogether different to do the same thing.

Dr. JEWETT. I think that is true as between research laboratories in more or less similar fields everywhere.

The CHAIRMAN. In other words, you prefer to develop your own device to reach the same objective than to take over a device of the independent.

Dr. JEWETT. That is true, Senator, even where automatically, as under these continuing license agreements, we automatically have the right to do it. That to some extent is tied up in human characteristics, in the characteristics of individuals.

Dr. LUBIN. I still am terribly upset about the long life of the tube.

Dr. JEWETT. Upset about it?

Dr. LUBIN. Yes. If I understand you correctly these other principles embodied in the long life of the tube have not been adapted to radio. In other words, I can't go out and buy a tube which would last 50,000 hours as compared with a thousand-hour tube. The reason, as I understand you, for that situation being so is that the people who make tubes won't make a 50,000-hour tube—

Dr. JEWETT (interposing). I don't say they won't. I don't know what their business is. My impression is that you can't do that. I have never tried to do it. It is very possible that somebody may be doing it, but I don't know of it.

Dr. LUBIN. It is not being done.

Dr. JEWETT. As far as I know it is not.

Dr. LUBIN. But from the point of view of the physics involved it could be.

Dr. JEWETT. Yes; except that there is a little difference, I presume, that the tube which would last 50,000 hours in the Bell System or in the telephone plant with its rigid controls of voltage, supervised battery supply, and everything of that kind, and maintenance, probably wouldn't last 50,000 hours in your radio set or my radio set.

Dr. LUBIN. Let's assume it would last only 20,000 hours, so you increase your efficiency by 2,000 percent. Now the reason for it, as you understand the situation, although as you say you don't know the facts, is that these manufacturers of 1,000-hour tubes by producing a 20,000-hour tube would cut down the potential demand for their product. They would sell less tubes, and their own personal interest keeps them from doing it. What is there, then, to keep anybody else

who doesn't make tubes today from going into that business and producing a 20,000-hour tube? There must be some reason why they don't do it. Do you know the reason? Is it that they can't get patents?

Dr. JEWETT. I will tell you what I think is a very practical reason, even though people have the full right to do this thing and facilities for doing it. In the first place, I think it probably is true that the best interests of the radio industry and the users of that, the radio set people, are served where you have uniformity, a certain amount of standardization, so you could use different manufacturers' tubes in different sets. There is a fundamental difference in the manufacturing concept of most of the people who are in the tube-manufacturing business, the big R. C. A., General Electric people, and the Westinghouse Co.

I have tried to outline that in the Bell System the emphasis has been on quality of stuff as it is reflected in service. That has inevitably forced us in the laboratories in the Western Electric Co. into a technique which is based on quality of performance without vast quantities, usually, for many things. Now the electric-light business, from which most of this vacuum-tube business has sprung, has been an art which developed from the standpoint largely of the lowest possible cost of the thing which you supply. I mean the cost of electric light bulbs has come down, and the technique which they developed and which they carried over into the vacuum-tube game is quite a different technique from that which we in the Western Electric employ, and they would have to learn a new technique, or somebody would have to learn this same technique in order to do this long-life coated filament type of thing. My experience has always been, in every line, that an organization which has lived long under one kind of technique finds it extremely difficult to pick up an entirely different technique, and there may be some of that in the explanation.

Dr. LUBIN. The thing that I just can't quite understand is that here are people in the United States foregoing an opportunity to make millions, to make something which is 20 times as good as anything on the market, and you wouldn't have to charge much more for it.

Dr. JEWETT. I am not so sure that they are doing that.

The CHAIRMAN. How about Western Electric? Could Western Electric manufacture these long-life tubes for radios?

Dr. JEWETT. Yes; it could, but I am not sure under their licensing arrangements whether they are fully free to go into that kind of business.

The CHAIRMAN. In other words, the cross-licensing agreement which the Bell has with R. C. A. and the others might prevent you from utilizing this very advantageous discovery which you made in the radio field.

Dr. JEWETT. In a particular field.

The CHAIRMAN. Do you know whether or not you could license that tube, say, to the Zenith, which I think is independent?

Dr. JEWETT. I don't know that, Senator.

The CHAIRMAN. You don't have a cross-licensing agreement with Zenith?

Dr. JEWETT. I don't know.

Mr. PATTERSON. Let me ask this question, Dr. Jewett, to follow up the chairman and Dr. Lubin. Is it your judgment that if the

Bell long-life tube patent were used in the manufacture of radio tubes, that it would provide, say, many times the life, use only a portion of the current, and reduce production costs, if the radio people used that tube?

Dr. JEWETT. I am not sure that the tube would be as cheap as the present short-life tube that you buy. My comparison of costs on the tubes themselves was between two tubes of the same breed. I suspect—I don't know what these prices are—that the tubes that are now supplied in radio sets are cheaper than this tube that I am talking about.¹

The CHAIRMAN. Well, Western Electric manufactures the larynx box for hospitals.

Dr. JEWETT. Yes.

The CHAIRMAN. It manufactures this deaf cell, and it manufactures other byproducts which are altogether independent of the communication field. Radio, of course, is within the communication field, so that the question presents itself consistently: How does it come that Western Electric doesn't develop and manufacture in the radio field a perfectly marvelous discovery which it has made?

Dr. JEWETT. It does—in that part of the radio business which they are in, which is the furnishing of radio stuff for communication purposes, but I think, if you want to pursue this further, you ought to get somebody from the Bell Co. who is concerned with this phase of the thing, but whatever the situation is at the present time as the result of the cross licenses which exist in this field of radio, which is largely in the broadcasting, they are tied up with a situation which goes back to patents of 20 years ago, a situation following the advent of the De Forrest three-member device into the field through the Telephone Co. I have forgotten when De Forrest made that invention, which, of course, was subordinate to an earlier invention by Fleming in England; my recollection is about 1906 it was invented as a wireless detector, and it served its purpose. Actually De Forrest I don't think, or anybody, knew exactly, what the mechanism was that he had there. But it had all these properties which have since become so valuable, but people didn't recognize it. It was in 1912, when we were struggling hard to complete a promise to have a trans-continental telephone line in San Francisco in time for the opening of the Panama Pacific Exposition and we were trying to find every conceivable amplifying device that we could think of that would work, that this thing, 6 years after its invention or 6 years after its patenting, was brought to our attention as a possible telephone amplifier, but it didn't work. But what did happen was that it was obvious to the scientific people that the thing could be made to work. They saw what the trouble was and they went ahead and did it. Well, we didn't think this thing was patentable. All I am leading up to, Senator, is that the impasse which arose out of a bunch of conflicting patents brought about the initial cross licensing thing which in modified form over the years is what controls the situation today.

The CHAIRMAN. Yes; I perceive that, and I feel it is probably outside of your line, but would you object if, on behalf of the committee, I asked you to make inquiry of the proper person in the Bell system

¹ Dr. Jewett subsequently gave the committee other facts showing that the long-life vacuum tubes would not be in economic balance with radio receiving sets whose average life is perhaps one-fifth to one-tenth that of these tubes. See "Exhibit No. 244" entered in the record on February 8, 1939, and included in the appendix on p. 1158.

or the Western Electric system, and notify the committee whether or not this cross-licensing arrangement prevents you from manufacturing this tube for the radio field? ¹

Dr. JEWETT. Prevents us, prevents the Western Electric, from manufacturing for the general field?

The CHAIRMAN. The general radio field.

RELATIONSHIP BETWEEN ISSUANCE OF VALID PATENTS AND PROPOSED SINGLE COURT OF PATENT APPEALS

Mr. COE. Mr. Chairman, I want to pursue a thought that was expressed by Dr. Jewett some moments ago. He said that he would be very happy if no patents other than valid patents were issued.

Dr. Jewett, you were a member of the Science Advisory Board which recommended, among other things, that there be established a single court of patent appeals. Dr. Bush, on his appearance before this committee yesterday, made this statement.²

The unfortunate situation that obtains today is that an individual who is granted a patent by the United States Government has no great assurance, as he ought to have, that that patent is valid and will be sustained. Anything that can be done to increase the presumption of validity of that patent when it is issued will aid in the introduction of new ideas in industry, because it will shorten and make easy the path of the man who has to forge the way.

Do you see any connection between the establishment of a single court of patent appeals and the percentage of valid patents issued by the Patent Office?

Dr. JEWETT. Most assuredly. I think it has a very direct relationship. It has been a number of years since I read that report of ours, I don't know whether that is mentioned or not, but if my understanding is correct, one of the first and most direct effects that would come out of the effect of the establishment of a single court of last instance would be the setting of more permanent standards than we have now for the guidance of the Patent Office in what does constitute a valid patent, and I should assume that unquestionably the establishment of such a single court would tend not directly, but indirectly, to increase the presumption of validity of the work that comes out of your office, because you are not going to be battered around from pillar to post with conflicting views as to what constitutes validity in different circuits. You have got some final court that tells you at least what the judgment of the court is as to its validity.

Mr. COE. In other words, in addition to the tendency to reduce the cost and duration of litigation, it will have the effect of increasing the percentage of valid patents, in your judgment?

Dr. JEWETT. Yes; I am not a lawyer and I am not a patent man, but I should assume that if this court is established along the lines that we of the committee had in mind, and of course we didn't attempt to say who would be on it, we assumed they would be competent people, competent men, men of training, and that they would serve for long periods of time, like other Federal judges do, they would inevitably build up certain standards, just as the Supreme Court has built up certain standards, that would become a background of substantial proven law, which certainly should make it easier for an

¹ In this connection see letter from Dr. Jewett to Senator O'Mahoney, under date of January 24, 1939, which was entered in the record as "Exhibit No. 244" at hearings held February 8, 1939, and is included in the appendix on p. 1158.

² Supra, p. 893.

examiner, looking at somebody's applications, to say whether the claims that are asked to be allowed fit in with the pattern which the courts have said constitutes validity.

Mr. COE. Thank you very much.

Dr. JEWETT. Does that answer your question?

Mr. COE. Yes; fully.

Mr. DAVIS. Mr. Chairman, if I may: Dr. Jewett, you spoke of your system getting out of the radio field, as I understood it. It is a fact, is it not, that your system has a very close relation to radio in the transmission of radio programs over your wires?

Dr. JEWETT. Absolutely.

Mr. DAVIS. You have a monopoly of that field, haven't you?

Dr. JEWETT. Substantially; yes. I think there probably are certain cases where the wires of the Western Union or Postal are used, but in the main you are correct. It is a monopoly because it is only telephone wires that can be used for this purpose.

Mr. DAVIS. Why can't telegraph wires be used?

Dr. JEWETT. For this simple reason, Judge: The Lord, in His wisdom, fixed it up so that whenever you create a telephone circuit, almost without exception you automatically create one or more telegraph circuits, but when you create a telegraph circuit, which is for the transmission of a very much less rigid kind of transmission, you don't automatically create a telephone circuit, and while it is true that there are some telegraph circuits of more recent origin that are capable of handling telephone transmission with some degree of adequacy, the great bulk of all telegraph circuits are not capable of handling telephony adequately, without complete revamping.

Mr. DAVIS. Well, if that is true why was it necessary for the A. T. & T. and the National Broadcasting Co. to enter into an agreement to the effect that the N. B. C. would only use A. T. & T. wires?

Dr. JEWETT. I don't know. Do they do that?

Mr. DAVIS. I think that is a matter of record; yes.

Dr. JEWETT. Maybe so. I don't know.

Mr. DAVIS. Do you know whether your company still requires a license from a broadcasting company now, in the United States?

Dr. JEWETT. From a broadcasting company? I don't know. I don't think so. I don't know just what you refer to.

Mr. DAVIS. I refer to the fact that it certainly formerly did.

Dr. JEWETT. Are you referring to the case of where apparatus which infringed patents was made by various people?

Mr. DAVIS. I refer to the claim of the American Telephone & Telegraph Co. that was made that no broadcasting apparatus was in existence that did not infringe on their patents, and consequently if the licensee from the United States Government to conduct a broadcasting station desired to operate, he would have to obtain a license from you.

Dr. JEWETT. I think I know what you are referring to. Of course, we furnished broadcasting stations; a lot of broadcasting stations are manufactured by the Western Electric. They automatically carry a license under patents. The stations of the people affected by the cross-licensing arrangement all carry it. I think what you are referring to are the things which were in existence at one time, and there may be some still, in which apparatus not made by us or our licensees was used for broadcasting purposes, and there I think we did have a

royalty arrangement, and that was reduced at one time to \$1 or something of that kind. So far as I know, there is no such thing as that, and it couldn't obtain in very many cases anyway because so many of the stations are furnished either by Western Electric or R. C. A. or General Electric or Westinghouse Co. or other licensees.

Mr. DAVIS. They all have licenses from you, you mean.

Dr. JEWETT. They are all licensed to manufacture this stuff. In what I said about getting out of the business, I was really talking about getting out of the broadcasting business as a service.

DISTRIBUTION OF TITLE TO BELL SYSTEM PATENTS

Mr. DAVIS. Well, now, of the 15,000¹ patents which are owned by your company, which I believe is the number used here, Senator O'Mahoney, they are all held by the A. T. & T. itself, rather than the subsidiary companies, are they not?

Dr. JEWETT. No; they are not, Judge. The title to the patents is in three different positions at the present time. The title to some of the licenses which were entered into 50 or 60 years ago with regard to the use within the system is in the A. T. & T. Co.; the title to some of them is in the Western Electric Co., and title to those in transit, generated in the Bell Laboratories, is in Bell Laboratories. The division between the A. T. & T. and Western Electric Co. is the result of the so-called 1882 contract, before the Western Electric Co. became a part of the Bell system, or the contract was entered into way back in those days, which was a contract between two independent people in which, roughly speaking, telephone-appliance patents ownership is in the Western Electric Co., and telephone patents, things like the transmitter, receiver, and transmission apparatus, is in the hands of the A. T. & T. Co.

That is the result of a very ancient contractual relationship. And there is this third group which I have indicated which comprises only patents which were generated in Bell Laboratories, in which the title to those patents temporarily is in Bell Laboratories.

FUNDAMENTAL AND SUBSEQUENT DEVELOPMENT PATENTS OF BELL SYSTEM

Mr. DAVIS. Were any of the key or fundamental inventions in the telephonic art discovered in your laboratory?

Dr. JEWETT. Yes. I am glad you asked that question because it bears on a question that the Senator asked, I think a while back. I think it is inevitable that the great bulk of what you might call the run-of-the-mine patents in an industry like ours will inevitably come from your own people, from your running a research department. I think that it is equally the case that those few fundamental patents, the things which really mark big changes in the art, are more likely to come from the outside than from the inside. There aren't very many of those. I am getting around to answer your question.

When I try to think of what are the fundamental patents, leaving out Bell's original patents which have been in the telephone business during its lifetime, which changed the whole picture of the future, there are only three of them. One of them came completely from the

¹ Note that this number was subsequently corrected to read 9,500. See "Exhibit No. 244" entered in the record on Feb. 8, 1939, and included in the appendix, on p. 1158.

outside, that is the vacuum tube type of thing which came clear from outside.

The second one, technically, according to the rules of the game, came from the outside, although that decision was the result of a long carried-out contest between a man on the inside and a man outside. between Pupin and George Campbell, but the result is that Pupin slightly ante-dated Campbell so two came from the outside. The third came from the inside.

Mr. DAVIS. Of course, the Pupin patent on the loading coil is one of the fundamental patents.

Dr. JEWETT. That is one of those I consider fundamental.

Mr. DAVIS. And the courts held that was a valid patent.

Dr. JEWETT. They held it was a valid patent and Pupin rather than Campbell was entitled to be considered the inventor.

Mr. DAVIS. What was the third?

Dr. JEWETT. The third is what is known as the filter patents, the wave filter patents which have made possible practically all of radio telephony and much of the carrier current type of stuff which we do, which was an invention of the same George Campbell. It was the result of a high line mathematical attack on the whole problem of transmission of high-frequency currents over circuits.

So that out of the three things which I picture as fundamental patents, one certainly came from the outside, a second one came from the outside although it came almost simultaneously from the inside, and the third came from the inside.

Mr. DAVIS. The telephone receiver was a fundamental patent, wasn't it?

Dr. JEWETT. Of course, that goes back to Bell's time.

Mr. DAVIS. And that was a Bell patent.

Dr. JEWETT. There wasn't any "inside" then.

Mr. DAVIS. I know, but I want to follow my line of inquiry. Now the transmitter, that didn't originate in the laboratories of your company, did it?

Dr. JEWETT. The fundamental idea of the transmitter?

Mr. DAVIS. That was originated in '78 by Berliner, was it not?

Dr. JEWETT. The fundamental idea of the transmitter is covered by a Bell patent. The particular form of microphonic transmitter is claimed by Berliner and Edison and others. I don't know who they were.

Mr. DAVIS. Of course recognizing the fact that you have been describing for some time, that refinements have been made, and we assume improvements, no doubt, I am talking about the fundamental patents, the key inventions, the principles involved, and all of these subsequent developments have simply been a development or improvement or refinement of the same key invention.

Dr. JEWETT. No; I certainly wouldn't agree with you on that, but I am perfectly willing to agree, if you like, that many of the things which came into the telephone business in the first 10 years of its life, 15 years, inevitably came from the outside. It was a little bit of a thing, there wasn't much inside. When it comes to the period of the last 25 years, there are only three of these things.

Mr. DAVIS. Are those key inventions, or refinements of them, still under patent control?

Dr. JEWETT. I don't know about the filter patents, I don't know how they stand because I have forgotten the age of them, but the

fundamental Pupin patents and the fundamental DeForrest patents have expired.

Mr. DAVIS. But there are still patents on refinements.

Dr. JEWETT. Oh, unquestionably.

Mr. DAVIS. Well, how about the transmitter and receiver?

Dr. JEWETT. The same thing there.

Mr. DAVIS. One of them originated in '76 and the other in '78.

Dr. JEWETT. The same is true of everything, Judge.

Mr. DAVIS. Is anybody manufacturing telephone apparatus in the United States to any degree except the Western Electric?

Dr. JEWETT. Oh, certainly, and there are a lot of transmitters and receivers that are being manufactured which are quite free from any Bell patents that may exist at the present time. That art is so old and so wide open that there is no control from the Bell system on that thing except insofar as specific adaptations and modifications are concerned. The Kellogg Co., Stromberg-Carlson, and a lot of people are making transmitters, and so far as I know they or anybody else can make pretty good microphonic transmitters without by your leave from the Bell system at all.

Mr. DAVIS. You mean for general telephone use?

Dr. JEWETT. Sure.

Mr. DAVIS. I didn't know that.

Dr. JEWETT. The art is like making agricultural apparatus. The fundamental patents on some of the Deering or McCormick stuff have run out, but those companies have probably got a lot of patents on detailed improvements of the stuff, but still there are other people making agricultural apparatus.

I don't see how you can escape that sort of a situation. If you go on in a continuing art, you will have these subsidiary patents, and so long as they pertain merely to improvements, until something fundamentally new comes along, while they may increase in number as the years go by, in value they tend to decrease because they pertain to more and more minute things. Of course when somebody comes along—take the telephone transmitter, if some fellow comes along now with an idea of a transmitter which is other than a microphonic transmitter, which is as good or better than a microphonic transmitter, he has then a fundamental idea with regard to transmitters.

The CHAIRMAN. But the original ideas on which the system was founded and built up are now open to the public?

Dr. JEWETT. Certainly. Bell's patents expired years ago.

The CHAIRMAN. But there are still in existence patents upon improvements which are substantially as effective in maintaining the strong position of the Bell system.

Dr. JEWETT. No; I don't think so, and I don't think the position of the Bell system is maintained by patents at all at the present time.

The CHAIRMAN. What maintains it now?

Dr. JEWETT. I think the thing that maintains the Bell system is the fact—I think it would be maintained as it is if there were no patents because of the fact that it is one of those few things which people have recognized as a natural monopoly. We tried in this country and tried in every country to work on a different basis and they have all come to this thing. That doesn't mean it is a monopoly that has to be run by one person, but rather telephony as it exists is a monopoly for the agency operating it.

The CHAIRMAN. Everyone recognizes that in a particular area it is much more convenient for the public to have the telephone system under one direction, whatever might be said about independent local enterprise. But you want us to understand that the patent system as such has ceased to be the effective agency in maintaining the Bell system.

Dr. JEWETT. Yes. I can state my point of view quite clearly, Senator, and it pertains only to the Bell system or to things like the Bell system which are, we will say, natural monopolies, if there are such. I don't think that if you were to abolish the patent system tomorrow, or if you were to greatly circumscribe it by its fundamentals in some way—I am not talking about procedural methods—that it would make one iota of difference to the Bell system with regard to the work it did itself for the development of communication, because we do not do work for the sake of taking out patents.

Now, that isn't saying, however, that we and the public we serve would not suffer immeasurably by that, because what would happen? We would be deprived; we don't have to fear other people's using our stuff, we are a natural monopoly, we don't care, let them use it if they want to. But what we do want is to have the opportunity to get as many ideas as we can from the outside and pay for them, and anything which tended to dry up the flow of ideas from the outside, which we had the opportunity to buy or be licensed under, or what not, would tend to circumscribe and shrink down the kind of thing which we do.

The CHAIRMAN. You referred a moment ago to an idea which, if it were developed, would be a fundamental departure. Now if such an invention as that were made and the Bell system were not in the position to obtain the use of it, it would be a very serious matter for the system, would it not?

Dr. JEWETT. Absolutely, and it would be more serious for the public.

The CHAIRMAN. Yes, to the public and to the stockholders and everybody who is employed by the Bell system.

Dr. JEWETT. Right.

The CHAIRMAN. Mr. Dienner, I think the committee will probably allow you to go on for 3 minutes.

Mr. DIENNER. I should like to have you state for the benefit of the committee your annual budget for running the research laboratory of the company.

Dr. JEWETT. In order to state that, Mr. Dienner, I think I want to make it clear to the committee and the Senator just what this is, in view of the testimony that Dr. Coolidge gave yesterday.¹ This laboratory of ours is different from any other laboratory in the world that I know of in that we have under one common direction everything from fundamental science research to the engineering type of engineering stuff which any manufacturer would do, and we designate the work of the Bell Telephone Laboratories as research and development because it is difficult to draw a line. Dr. Coolidge was describing what is a part of our laboratory.

Now the total budget of Bell Telephone Laboratories for the three things it does, fundamental science research, the engineering type of stuff which is done in these 15 laboratories that he was talking about; and the consulting services which the scientists give to the Bell system; those three things involve an expenditure of between 20 and 22

¹ Supra, p. 911 et seq.

million dollars a year, and of that amount the consulting services and the engineering type of stuff, by a liberal or conservative division, things which probably everybody would agree to, constitutes more than half of the amount.

The best figure, and I am up against this question all the time, that I would give would be that the expense of running the kind of a thing which Coolidge was talking about yesterday, and which we call our research department, is somewhere between seven and nine million dollars, possibly, a year. Now when you contrast that with the General Electric you must remember this, or any of these other laboratories, you must remember this thing that Bell Telephone Laboratories is doing, the research and development work. There are a few other rather small ones, the R. C. A. has some, General Electric, and Westinghouse, but by and large you can say this with a fair degree of accuracy, that Bell Telephone Laboratories is doing the fundamental research development work for the Nation, the one place it is done, whereas the electrical or chemical industries, or electrical industries, General Electric does a big lot, Westinghouse, other people do things; so if you wanted to get a direct comparison of the amount of the money spent for research and development in the communication field, from the power and light field, you would have to compare Bell Laboratories with the sum total of these other places who are doing similar work.

Mr. DIENNER. I wish you would discuss briefly the concept that there are certain complex problems which are encountered in your system which are of such extensive and difficult character that they would be totally unable to be solved, except by coordinated effort of a number of men.

Dr. JEWETT. Well, of course, Mr. Dienner, that is true of the great bulk of the more fundamental problems which we are confronted with. Specifically let me take the case of transcontinental telephony, which was a big problem 20 years ago. It is just inconceivable that that problem could have been solved by any haphazard approach by individual attack on the thing. It was a thing which had definite objectives, simple objective, yes. When you came to analyze what needed to be done to project the art which now enables you to talk from here to here over to this point, find out what had to be done, you found the solution of this problem required the solution of a very large number of problems in widely unrelated fields, and the only way the main problem could be solved would be for us to attack all of these problems with a frontal attack, with expert knowledge in each company, which was on the attacking front, and when they had solved their things, bring them together into the common answer. That is the process which is used in all laboratories in all fundamental work, and there are many things in every field, not only in our business, but everywhere else, which in the present state of the science can only be solved within a reasonable time by cooperative action of people who are skilled in different techniques and arts.

The same thing is true, even more true, of this development of recent years with us by which we put 10 or 15 or 20 telephone conversations on a single pair of wires in our endeavor to get enough circuit so you can do this with no delay service; all tied up. It just could not be done except by a cooperative operation under control.

OPPORTUNITY FOR INDEPENDENT INVENTORS

Mr. DIENNER. I would like to ask you one important question. You are convinced of the necessity for research in large organizations of scientists in order to attack the complex problems. Do you see any room that is left for the independent inventor with those research organizations working?

Dr. JEWETT. Absolutely. I heard some of the testimony yesterday. I do not agree with some of it. I think that there are certain sectors where the independent inventor cannot operate; he never could, cannot now, and never will be able to operate. There are certain sectors, which I tried to indicate in my answer to the judge over here, the very fundamental things where I think the chances—in our case it happened to be 2 out of 3, I think in the majority of cases, the fundamental idea, the chances are 10 to 1 they are going to come from outside big laboratories simply because of the nature of the things. They are a creation and brain child of particular individuals who have that capacity and knowledge and heaven knows we cannot collar them all, even if we wanted to.

Now in the other sector where the independent inventor has operated, I think that instead of being restricted the opportunities are increased because every invention which we or anybody else makes, or every publication of new results which we make, gives 10 jumping-off places to one that existed before. When it comes to those things which are kind of peculiar to the nature of your business, where intimate knowledge of the day-by-day affairs are concerned, the outsider just cannot possibly know about that, and there is no way of doing it. We tried one time years ago, when M. I. T. set up a scheme 'way back in Mr. Vail's time, of trying to do some industrial development as a part of their teaching tools, to give them some problems and it just was a physical impossibility to do it because you could not set up the mechanism which enabled a bunch of people over in Cambridge, Mass., in an educational institution to have the intimate contact with the problems we will say of the Western Electric Co., at Hawthorne, Ill., or the telephone company out in the Senator's State.

There are certain kinds of things that have to be done inside the business.

Mr. DIENNER. Mr. Chairman, I have no further questions to ask the witness, and unless he has something further to say or the committee wishes to inquire further, I should be glad to have the witness released.

The CHAIRMAN. It is now after 4 o'clock and coming to time for recess. Are there any questions to be asked by any members of the committee? Dr. Lubin? Admiral Peoples? Mr. Williams?

Representative WILLIAMS. I have none.

The CHAIRMAN. Judge, you have completed your questions?

Mr. DAVIS. I have nothing except, Mr. Chairman, I should like to suggest, with the permission of the committee, that Dr. Jewett, in making the reply and giving the information you called for, also advise the committee whether the Western Electric Co. makes available for purchase by independent companies those long-term tubes.¹

Dr. JEWETT. Will you limit it to "makes available in some fashion, either by purchase or rental?"

¹ See letter from Dr. Jewett to Senator O'Mahoney under date of January 24, 1939, which was entered in the record as "Exhibit No 244" at hearings held February 8, 1939, and included in the appendix on p. 1158.

Mr. DAVIS. Yes.

Dr. JEWETT. The reason I say that, Judge, I think there are quite a lot of arrangements with these connecting companies by which, at least in the past, certain things of our manufacture which are used generally in the Bell System have been rented to the connecting company by the local company, rather than sold.

Mr. DAVIS. Make available for use, and also whether they are of the same quality as those you describe.

Dr. JEWETT. They will be the same quality. I can answer that question right now.

Mr. DAVIS. The reason I ask that, Doctor, is because you made the remark in the course of your statements that they made available to them such as were needed for their purposes.

Dr. JEWETT. For what other reason would they want to have them?

Mr. DAVIS. I thought your company might happen to have some views on what they needed, from that remark.

Mr. JEWETT. I didn't intend to convey that idea.

Mr. DAVIS. If it is other than purchase, I should suggest that you state in your reply the terms upon which they are made available.

Dr. JEWETT. May I make just a statement, a sort of confession of faith, which I would like to lay before the committee? I indicated at the beginning that I have had some interest in this whole patent history and system from a philosophical standpoint. It was intensified by my having been a member of the science advisory board. I think it is a wonderful thing. I don't think there is any question about it. I am not very much concerned, as a user of the system, with the mechanisms, changes in the mechanisms, the procedural changes, which ought to be reviewed from time to time, and have been reviewed by the Congress ever since the first laws were passed. But I would be very much concerned if anything was contemplated which struck at the roots, the fundamentals, of the system itself, and it would seem to me from some of the questions which were asked and answered here yesterday as though there is a thought that it is the inventor and what he gets from the Government which is the principal concern, whereas, I have always conceived that nothing is taken from the public domain when an invention is made; something is added to the public domain. That is what an invention is, and the public is willing to pay a price to have that thing done, and it is to the public interest, it isn't in the interest of the A. T. & T. or of F. B. Jewett or anybody else; it is in consideration of those possible changes which affect modern procedure. We don't want to give too much consideration to inventors, it is the public that should interest us.

The CHAIRMAN. In view of what you have said and in view of the testimony which was given here this morning by Mr. Flanders with respect to inventions in the machine tool trade would it be proper to summarize by saying that as through the years inventions have been made and have become public property, thereby increasing the domain of public knowledge, it has become more and more necessary for cooperative and collective action to make the new pioneering efforts which are necessary to extend human knowledge beyond the present frontiers of knowledge?

Dr. JEWETT. I think that is right, Senator, and I would add one more thing. What I have heard in the last 2 days and what we have talked about today has been civil stuff, principally. There are many

things in this world which are needed in the national defense which can only be done on a huge scale if they are going to be done at all, and so long as there is the element of war still in our presence, and so long as these people with whom we may be at war don't have the same concept of doing things that we do, so long as they are willing to set the thing up to do it on a huge scale, to me it would be suicidal for us, as a matter of public policy, to take any step which would tend to diminish our ability to do things wherever they have to be done in the huge way that may be required. There are many things in every domain of applied science that you can find where they simply can't be done, or can't be done economically, except on a huge cooperative basis.

The CHAIRMAN. And as you stated in the early part of your testimony this afternoon, they cannot be done without planning.

Dr. JEWETT. That's right.

The CHAIRMAN. And without making the production or the manufacture of devices subordinate to the uses to which they were to be put, and as you stated in closing your testimony, these extensions of human knowledge are to be accomplished by cooperative actions of groups under control. I think I quoted your exact language. My attention was called to the word "control" because in recent years there has been a good deal of tendency in some quarters to criticize that idea of control.

Dr. JEWETT. I would like to add just two more things which have occurred to me. One seemed to be from some of the questions I heard answered yesterday that the only way of extending the benefits of a patent to the public was through licenses. Now, I can conceive of hundreds and hundreds of cases where the maximum benefit to the public would be in the dissemination of the thing covered by the patent without extending the license to anybody. That is one thing.

The CHAIRMAN. One question, of course, which reasserts itself over and over again in any consideration of the patent system is the effect of patent pools and cross-licensing of patents. Would you care to make any comment upon that?

Dr. JEWETT. Of course you are getting somewhat outside of my field, but I have this picture, Senator. A patent, to me, a patent property, is a temporary form of real property which has limited life, it is limited to whatever the state says it shall be limited to; it is the most fragile kind of real property that there is because its value may be destroyed overnight and you may have a perfectly valuable patent today, I come along tomorrow and all your work goes out. Beyond that when it comes to the use which you make of our real property, whether it is a patent or any other kind of thing, the same laws apply to it, and the only difference between the two things is that this is a very limited kind of real property. Now, you wouldn't allow me to go out and buy up all the cows in the United States and monopolize that.

The only other thing, Senator, and then I am through with the thing, apropos of what Coolidge said yesterday about publication. We all do it. Patents are only one form of publication. The Bell Laboratories ever since it was organized in 1925—and I am not sure but what it was before that—has done this; the Bell System gets out a technical quarterly called the Bell Technical Journal. It is a highly scientific magazine about the size of Harper's Magazine;

it gets it out 4 times a year, and it has the biggest circulation of any truly scientific magazine in the world, it has a circulation at the present time between 9,000 and 10,000 copies of an issue. We disseminate this knowledge; everything that is done is passed on to see whether it ought to come within the purview of the Patent Office, and if it ought to it goes before the Patent Office. Patents may or may not issue on it. Every other thing is published. And we do it, why? Partly for the prestige, yes; partly to satisfy the normal human desires of the men who are in the laboratories, but more because we profit more in the development of the telephone business for the people of the United States by having the base of knowledge increased than we do by trying to keep the stuff secret. We are perfectly willing to publish it for the sake of what we get in return.

The CHAIRMAN. Thank you very much, Dr. Jewett. We enjoyed your testimony this afternoon.

Before we adjourn, may I ask you, Mr. Dienner, to announce what witnesses you have called tomorrow and what their subjects will be.

Mr. DIENNER. Mr. Chairman, I assume we will sit tomorrow afternoon?

The CHAIRMAN. In the morning.

Mr. DIENNER. Only in the morning?

The CHAIRMAN. We will sit in the morning and afternoon unless there is some development that I don't know anything about now.

Mr. DIENNER. I should like to call tomorrow, Mr. Farnsworth. He will lay before us the case of a young man who with all the difficulties in the world before him was able to come forward with a brand-new idea. He will furnish the fundamental theory of the modern television which he conceived when he was 14 years old, and his difficulties, the difficulties of securing patents, and the interferences and difficulties which he encountered in the application stage.

Then I should like to call Mr. Lawrence Langner, who will give us a comparison between the laws of the United States relating to patents and the laws of foreign countries. I think that should be very interesting, as giving us some idea of what certain provisions in the foreign laws are intended for as compared with corresponding provisions or lack of provisions in the United States laws.

Then I should like to call, following Mr. Langner, Mr. Carlton. Mr. Carlton represents a group of manufacturers of parts of automobiles known as parts manufacturers. His testimony will go to the peculiar situation surrounding the manufacture and supply of automobile parts to the manufacturers of automobiles, and the rather restrained use of patents in that situation.

Then I should like to call one more witness on the general field, Mr. Baekeland, George E. Baekeland, of the Bakelite Co., who has a very interesting story to tell of how an industry was started first as a secret process and then abandoned because of its limitation and turned to the patent system as a proper basis for an industry which could grow.

The CHAIRMAN. You won't be able to cover all of those tomorrow?

Mr. DIENNER. I shall not be able to cover them all tomorrow.

The CHAIRMAN. The committee will stand in recess until tomorrow morning at 10 o'clock.

(Whereupon, at 4:25 p. m., a recess was taken until Thursday, January 19, 1939, at 10 a. m.)

INVESTIGATION OF CONCENTRATION OF ECONOMIC POWER

THURSDAY, JANUARY 19, 1939

UNITED STATES SENATE,
TEMPORARY NATIONAL ECONOMIC COMMITTEE,
Washington, D. C.

The Temporary National Economic Committee met pursuant to adjournment yesterday, at 10:30 a. m. in the Caucus room of the Senate Office Building, Senator Joseph C. O'Mahoney presiding.

Present: Senator O'Mahoney (chairman), Representative Williams, Messrs. Henderson, Ferguson, Patterson, Peoples and Coe.

Present also: Senator Homer T. Bone of Washington, chairman of the Senate Patents Committee. Counsel: John A. Dienner, special counsel for committee; George Ramsey, of New York, assistant to Mr. Dienner; Justin W. Macklin, First Assistant Commissioner of Patents; Henry Van Arsdale, Assistant Commissioner of Patents; Grattan Kerans, Administrative Assistant to the Commissioner of Patents.

The CHAIRMAN. The meeting will please come to order. Mr. Dienner, are you ready to proceed?

Mr. DIENNER. Yes, Senator; I would like to call as the next witness Mr. Philo Farnsworth. Mr. Farnsworth, will you please be sworn?

The CHAIRMAN. Do you solemnly swear that the testimony you are about to give in this proceeding shall be the truth, the whole truth, and nothing but the truth, so help you God?

Mr. FARNSWORTH. I do.

The CHAIRMAN. Thank you.

TESTIMONY OF PHILO T. FARNSWORTH, VICE PRESIDENT FARNSWORTH TELEVISION, INC., PHILADELPHIA, PA:

Mr. DIENNER. Mr. Farnsworth, will you please tell us about your background and history?

Mr. FARNSWORTH. My introduction to television and to the field of invention happened so far back that it is difficult for me to remember just when. My first technical training came from having charge of a farm lighting system and the electric motors and so forth that were necessary to keep in repair, and that was at the age of 12. I was finally given the responsibility for this rather modest amount of electrical equipment because no one else could keep it running.

This is only significant in that it gave me a background at a very early age of the elements of electricity and gave me an incentive to study electrical physics and, through the medium of popular magazines a knowledge that there was such a thing as television.

The CHAIRMAN. Let's chalk one down for the popular magazines.

BIRTH AND DEVELOPMENT OF FARNSWORTH TELEVISION IDEA

MR. FARNSWORTH. It also gave me a theme for research which has continued throughout the years as a guiding light, or as a direction for research and development, namely the elimination of all moving parts from television equipment. That idea I had fairly well established in 1921, when I was 13 years old, so that the moment I discovered tools, out of textbooks I mean, which would enable television to be done without moving parts, the invention seemed almost simultaneous, as a matter of fact simultaneously with the discovery that there was an electron and a photoelectric effect.

In 1922 when I was a freshman in high school I made the first invention, my first big invention in television, and it consisted of a means for producing an electric counterpart of an optical image. At that time it was a daydream, a daydream only. I had no facilities for doing research, I had no money to buy equipment, all I had was access to a very modest school library, but my sum total of equipment which I had for forming any definite practical idea as to the problems in television consisted of a static generator of a physics laboratory and an old Braun tube.

Nevertheless, this daydream, as you might term it, had the basis for perhaps the most important invention and certainly the earliest invention in the electronic field, namely, that of a tube for electrically transmitting a picture without employing any moving parts.

In the 2 years following 1922, that is 1923 and 1924, I continued to do research in libraries and with any type of electrical equipment that I had to work with, with the idea of evolving a complete television system free from all mechanical inertia.

My family at that time moved from Idaho, where I was attending high school, to the town of Provo, Utah, where I had slightly more laboratory equipment at my disposal and continued to develop the previous notion of television without moving parts, so that in 1924 I had evolved what is essentially the present system of electronic television. Again I had no money and no suitable laboratory facilities to reduce this theory to practice. As a matter of fact it has taken 15 to 17 years to make that a practical reality, but I didn't know how long it was going to take then, very fortunately.

In 1926 I was in Salt Lake City looking for anything I could do either to continue my schooling—my father had died and left the responsibility of the family to my mother and myself, and I was hunting for work, when I met two California businessmen to whom I disclosed my hopes and dreams of this television idea, who agreed to put up a sum of \$8,000 to see if it was worth anything. I decided that was the proper time to get married, being 19 and quite old, so I got married and moved to Los Angeles, where we set up a laboratory, such as it was, to explore at least as well as we could with \$8,000, the possibility of this television idea.

After just about 2 months, 2½ months, as a matter of fact, of intensive work, we had used up all of the \$8,000 and we had taken the idea to the California Institute of Technology and to experts wherever we could find some who would listen, and I convinced these early backers of mine, one of whom is Mr. Everson, who is here with me today, that at least the idea had some merit, but we had the basis for a nice patent, perhaps, but no substantial experimental evidence yet.

Mr. Everson's step then was to interest—and it sounds quite easy—further financial backing in San Francisco, which he did very effectively and a group of San Francisco businessmen decided that it might be worth while to take a flyer on this television idea. As one of the men put it, it was a darned crazy idea but somebody ought to put some money in it. So they did agree to put up \$12,000 more to see a little more what it was worth.

At that time, which was in October of 1926, we established the Crocker Research Laboratories in San Francisco for the purpose of continuing research on this idea which was essentially to take all moving parts out of television. Twelve thousand dollars sounds like it should be enough to find out what the idea was worth, but after 18 months we had spent 60 thousand, and without listing the problems in detail, I think it can be understood that it is very much as though someone with a considerable amount of knowledge—or it doesn't matter really to what extent the knowledge runs—is suddenly cast on a desert island, removed from all tools, and given the job of building a steam engine. That means building the tools to build the tools to build the tools to build the steam engine, and our problem of making a laboratory was, in the early part of our work, by far the greatest problem. Also, the state of the photoelectric art and of electric optics at that time was not far enough advanced to carry out properly the basic conception of the electron image—scanning, as we have called it.

In 1926 and 1927 the photoelectric materials that we had were almost scientific playthings. The photoelectric material available were the haloid of alkali metals, particularly sodium and potassium, and the construction of photoelectric cells required an amount of knowledge and art and technique far beyond that available to me, and so I proceeded to get all the help from scientific institutions I could. I pestered the people of the University of California and Stanford and California Tech and anybody who would give me information or sell information. But to make a long story short, in the latter part of 1927 we demonstrated a television transmission which used apparatus that did not employ a single moving part.

The CHAIRMAN. You said that you pestered everybody who would give you information or sell you information. How much information did you have to buy?

Mr. FARNSWORTH. Most of it.

The CHAIRMAN. How did you buy it?

Mr. FARNSWORTH. Through the funds made available to me through this group of bankers.

The CHAIRMAN. And what type of information was sold?

Mr. FARNSWORTH. The technique of forming electron surfaces, the experience necessary to blow glass and evacuate tubes and sensitize photoelectric surfaces in vacuum, and purification of the alkali metals, the electrical circuits necessary for amplification, and so much similar material that it practically covers the entire field of physics and optics.

The CHAIRMAN. Were you actually buying the information or the preparation of the information, the service of conveying it to you?

Mr. FARNSWORTH. The services of the scientists or technicians who gave it.

The CHAIRMAN. In other words, it was information already available.

Mr. FARNSWORTH. It was information known at that time but not known by me.

Mr. PATTERSON. Mr. Farnsworth, was this the first transmission of a purely electronic television image?

Mr. FARNSWORTH. Yes; it was definitely the first transmission of an electronic image, and as a matter of fact I made an effort at that time, but failed, to be the first to transmit a television image. I could have known then that would be impossible. C. Francis Jenkins had transmitted television images prior to that. Earlier that year a demonstration was made by the Bell Laboratories of a mechanical television system.

Mr. PATTERSON. What year was that?

Mr. FARNSWORTH. This was 1927.

Mr. PATTERSON. In New York City?

Mr. FARNSWORTH. The Bell system transmission was from New York to Washington. Our transmission was simply a laboratory demonstration that an image could be converted electrically, entirely electrophonically or electrically, into the required signals and reconverted into an image.

Mr. PATTERSON. From New York to Washington?

Mr. FARNSWORTH. Was the mechanical demonstration.

Mr. PATTERSON. Didn't they have public demonstrations in New York City, too, at about the same time?

Mr. FARNSWORTH. At about the same time; yes.

It required about 1 year, then, to convert, to build a minimum amount of laboratory technic and to reduce an idea conceived in 1922 to a practical result in 1927. Incidentally, the first image transmitted was about a 60-line image of a dollar sign. That seemed to climax the work, when we could get real money and see the sign of real money, so at that time our company was incorporated and we continued to do work to perfect this idea and to perfect an organization and laboratory capable of eventually making something practical out of a laboratory toy.

About a year later, in 1928, we had a television transmitting tube as sensitive as then theoretically possible. I hate to say what that sensitivity was, and by sensitivity I mean the amount of light that it was necessary to project on to the tube in the image in order to get a useful result. The notion was obviously impractical for televising a subject because the amount of light on the subject would have caused it to blow up and burn up immediately, whether that was a subject or object.

But, also to just gloss over the immediate years of the ensuing years, the sensitivity then, which was theoretically possible was agreed by all the consultants that I consulted were as approximately 100,000 times less than is available today with the same tube and with substantially no change in the tube other than improved methods of making it.

Since 1927 one of the major problems has always been to obtain sufficient money to continue the experiments. There has never been any substantial revenue, or almost no revenue, coming in, and it speaks well for the original backers of this invention that they have now spent greatly in excess of a million dollars without any revenue for a development which has taken 13 years. It will be 13 years in May since it started.

In 1928 and 1929 we began to get recognition for our work and other engineers and inventors agreed that it was a difficult problem to work out, but would be the ultimate way television would be accomplished, and in 1929 Philco, the Philadelphia Storage Battery Co., took a license under patents which we then had issued, and under the promise of what our future developments would be.

But to go back to the point we had reached where we had the maximum theoretical sensitivity of our transmitting tube, it has been my experience that whenever a stone wall was encountered where possibility of scaling it seems hopeless, there is a grand opportunity for a good invention, and it happened in this case to call for one of the most important developments that we have made, namely that of the principle of electron multiplication. What we needed was more electrons for a given amount of light.

It may seem a little radical to expect that electrons could reproduce themselves, but this is in effect what they did. We produced an electron stream and had it arranged that it was capable of producing offspring at the rate of 5 per litter, 5 to 10 per litter, and then to take the offspring, and they have the fortunate property of being born mature so that in about less than one-billionth of a second they can produce—each child can produce, with no question of sex involved, either—5 to 10 more in less than a billionth of a second.

If you consider how fast that electronic multiplication process builds up you can see that in less than one-millionth of a second it would evolve a number of electrons. Each initiating electron will evolve 25 with 500 ciphers, probably more electrons than there are in the universe. But the problem is not to get the electrons but to control the process so that there is a definite proportionality existing between the number of initiating electrons and the final output. That principle, which is called electron multiplication, now is in universal use throughout the world. There are many different types of tubes employing the process, and it has added perhaps the most powerful way of amplifying feeble electric currents that exists.

When we divide the number of electrons given out by an optical image by the number of divisions that are necessary to show fine definition in an image, which amounts to perhaps 400,000, the apparatus begins to count electrons. Even though the electron is a mighty small unit it is not small enough, and we begin to count the electrons. Now, the electron multiplier minimizes the extent of interference produced by this process of counting electrons, and that is why it is important in television. Many inventions have come from this fundamental principle. They are employed in perhaps 100 different varieties of tubes. It constitutes one of the very important byproducts of television research.

MR. PATTERSON. On that point, I don't mean to interrupt the continuity of your thought, but I think it is germane. In getting your increased sensitivity did you develop any devices that are helpful to the radio industry generally? If so, will you put it in the record and tell of that?

MR. FARNSWORTH. In the field of electron multiplication the device No. 1 is simply what might be termed a multiplier electric eye. Ordinarily, photoelectric eyes are measured in millionths of an ampere per unit of light. Photomultipliers are measured in units 1 million times that big. I have a tube that I will show you that is measured

in 50 amperes per unit of light, whereas the corresponding tube available on the market previously might be measured in 30 millionths of an ampere, or over 2 million times improvement in sensitivity.

As yet we don't know to what extent this principle will be important in the radio industry, certainly to a very great extent, but in just what fields it will be important it is hard to say as yet. Certainly in the very short wave region below 1 meter and below 5 meters, it is already the most powerful tool in measuring. In measurement of very feeble currents such as used in stellar photometry or in various scientific applications or in some projected military applications the tube is by far the most powerful tool available to the physicist and inventor.

A particular tube which I have will record the light of a candle 10 miles away, and it will do so also instantaneously, whereas other methods of doing it might require 5 or 6 seconds and maybe that many minutes for its measurement.

Mr. PATTERSON. Just what do you mean by 10 miles away? I'd like to have you develop that for the committee. I have spent considerable time in it and I want the committee to hear it.

The CHAIRMAN. Do you mean to imply that the committee doesn't understand what is said? [Laughter.]

Mr. PATTERSON. You win, Mr. Chairman.

Mr. FARNSWORTH. The measurement of small amounts of radiation, either visible or invisible, is usually made by the heating effect of the radiation or alternatively by the fact that radiation produces the emission of the electrons from certain suitable materials. Its usual practice when extremely small amounts of radiation are to be detected is to allow this process to continue over a long enough interval so that the accumulated effect is measurable on the most sensitive instruments we have. Now, in the photomultiplier, due to this multiplication process, although only one electron is released, a million or so, in some cases a billion billion, are available for measurement. I say that number although it is so astronomical it may not mean much. We can in effect detect one electron per second.

The CHAIRMAN. In all of this it is still necessary to have an instrument at each end, is it not, one at the end at which the image to be televised exists, and at the end at which it is to be seen.

Mr. FARNSWORTH. Yes; although it is not necessary to have a visible image at the transmitter.

The CHAIRMAN. Has the art been sufficiently developed, for example, to enable you to segregate the light of a single star, let us say, from all the others?

Mr. FARNSWORTH. Only through the use of the telescope. If we could measure down to very low intensity stars, stars that would require considerable period to photograph, they could be checked and the intensity of that star determined to a much greater degree of accuracy by direct reading instead of photography.

The CHAIRMAN. By the use of the telescope you could segregate a particular star from all the other stars.

Mr. FARNSWORTH. With a suitable eyepiece you could segregate that from the remainder of the stars and measure its intensity, and you could do so and measure perhaps thousands of stars per hour instead of a few. That only indicates the type of application that this tube is adapted to. A more common application is in talking motion pictures where the tube acts not only as the photo cell but

also as the amplifier. It eliminates quite a bit of costly equipment in the talking motion picture. We are now making these tubes for use in sorting lemons, in sorting beans, and so many peculiar industrial applications that it is hard to remember that it grew out of television research.

Mr. DIENNER. Mr. Farnsworth, did you have any contact with foreign television corporations?

Mr. FARNSWORTH. We had, I think, in 1933 or '34 representatives from many foreign companies visit our laboratories. One in particular, the Fernseh interest in Germany, which is the combination of the Zeiss-Ikon and the German Bausch Co., became interested in our work on electronic television and took a license which resulted in an exchange of licenses and an exchange of technic between ourselves and those in various countries in Europe. The Baird Co. in London visited our laboratories and we arranged an exchange of licenses, patent licenses, and technic for use in the British Empire, and since then we have licensing arrangements in Australia, until now our patents and technic are employed throughout the world.

Mr. DIENNER. Is it a fact that the British and German television interests put the equipment on the market before it was done here in the United States?

Mr. FARNSWORTH. They have. They have made available to the public, equipment that is at the present time very satisfactory. The images transmitted are clear and large and show good definition and the receivers are very satisfactory. Program experimentation is making fine progress, and they have a television service which is in advance of that that we can boast of in the United States.

Mr. DIENNER. What is the explanation for their use of it before it was used here in the United States?

Mr. FARNSWORTH. Their problems of application are vastly simpler than in the United States. In Great Britain two television stations can cover the country. In the United States perhaps the same service would be represented by a hundred or so; it would require a hundred or so stations. Then also, their way of paying for programs in both England and Germany makes available a certain amount of money for commercial application of television which must come in the United States from individuals, so that the service here is in more or less a position of lifting itself by its own bootstraps for awhile. We can't broadcast profitably without receivers and we can't go into any extensive receiver production without transmitters, and program research doesn't get very well under way without transmitters, and it is very much again the same problem of building a steam engine on a desert island without any other facilities. Fortunately that situation is, in pictures, being very rapidly changed now and television for the American home is going to be a service before very long. Also, this time hasn't been entirely lost. We have the benefit of foreign experience on problems of getting television started, so when television does emerge as a commercial service in the United States it will be, I think, a better service than is being made available abroad.

The CHAIRMAN. The last figure which you gave as to the cost of your research was \$60,000.

Mr. FARNSWORTH. That is the first 18 months.

The CHAIRMAN. What would you say this research has cost as a total?

Mr. FARNSWORTH. It has cost considerably in excess—I can't give you the exact figure, but considerably in excess of a million dollars.

The CHAIRMAN. And to raise that sum, it became necessary for you to bring larger and larger numbers of persons into the enterprise with you.

Mr. FARNSWORTH. Yes; it has been necessary not only for the original stockholders to put up money but for those of us who haven't had facilities to decrease the percentage of our holdings by bringing in anyone interested in helping us continue.

The CHAIRMAN. So that actually this is an illustration of cooperative research.

Mr. FARNSWORTH. Yes. It has grown from the status of an individual inventor to that of a highly organized research and efficient research laboratory.

The CHAIRMAN. In other words, when this study is finally completed in any particular item along the road, it will be a group research.

Mr. FARNSWORTH. A group research.

The CHAIRMAN. In which the credit will have to go, of course, the major part of it, to the original inventor.

Mr. FARNSWORTH. Well, there I want to make it very clear that the inventor in a project of this kind can only be a small unit, that the successful financing of the venture, its continuation over such a long period of years, the patent counsel, the other legal counsel required, and the technical staff which must eventually be evolved are major items in carrying such a complicated art to completion.

The CHAIRMAN. In other words, your experience illustrates a fact which is becoming more and more apparent in the modern world, that advance of all kinds, technological advance and scientific advance and practical advance, is getting to be more and more the product of collective and cooperative effort.

Mr. FARNSWORTH. Yes; although we must not lose track of the fact that inventions as such, important inventions, are made by individuals and almost invariably by individuals with very limited means.

The CHAIRMAN. You see, there is a concept abroad in the world that we are still living in the era of the rugged individualist, to use a phrase that has been more or less in common parlance for some time, but stories such as you are telling us this morning clearly demonstrate that that era is receding rapidly into the past and that we must find a way of working together if we are going to achieve really beneficial results for all.

Mr. FARNSWORTH. Yes; but do you see any difference in this development than in that of any other major invention?

The CHAIRMAN. Oh, yes; yes, I do; because to use a phrase that you used a little while ago, it is now necessary for the inventor to develop the tools to make the tools to make the tools to make the locomotive. So that you must have this cooperative effort, and there was a time when the inventor could make the monkey wrench and he made it and he didn't need any cooperative effort.

Mr. FARNSWORTH. But in technological inventions I doubt if the situation has changed much. Edison in his development of the electric light required facilities of the same order as are required in television. The telephone in its fundamental conception only required less facilities for its original adoption because scientific knowl-

edge had not then advanced to a point where very much of anything in the way of a telephone could be evolved.

The CHAIRMAN. Of course Edison was breaking into this field where it was necessary to bring together cooperative effort and the knowledge of others, perhaps not to the extent that you had to do that, but I conceive Edison to be a figure in the modern world very different from Alexander Graham Bell, for example, who invented the original device on which the whole telephone system is based. I rather imagine that Bell didn't require, for the patenting of that device, anything like the cooperative effort that you have required to develop your idea, although the progressive improvements of his device require the sort of laboratory that was described here yesterday by Dr. Jewett.

Mr. DIENNER. I think our chairman has put his finger on the significant fact that although an invention starts with an individual and that individual must somehow arrange to make the tools to make the tools to reach the objective, the research laboratory is the human tool concept of the picture. The physical tools, the iron and steel tools, are only part of the picture. The human tools must also be applied, such as are available, and I think our brilliant chairman has caught the modern situation in this particular case history. Here is a man who has an idea. He must make the tools on the physical side and on the human side in order to develop the thing fully.

Mr. PATTERSON. Mr. Farnsworth, what is your title in the Farnsworth Television Corporation?

Mr. FARNSWORTH. I am vice president in charge of research.

Mr. PATTERSON. How many patents, approximately, have you taken out?

Mr. FARNSWORTH. I think the number runs into around 46 at the present time, with probably twice that many applications entered.

Mr. PATTERSON. Out of those 46, and applications pending, how many, approximately, are you the sole inventor of?

Mr. FARNSWORTH. I should say three-fourths of those.

Mr. PATTERSON. You began with this idea that you conceived a great many years ago, and you had no money. You borrowed money. I would like to ask you, are you still in control of your company?

Mr. FARNSWORTH. I am not in control of the company but I still own twice as much stock as any other stockholder, have twice as much interest in the company as any other stockholder.

Mr. PATTERSON. You are the largest stockholder?

Mr. FARNSWORTH. I am the largest stockholder.

(Representative Reece took the chair.)

The ACTING CHAIRMAN. I came in a little late, and for my information will you please state if you and your associates developed the principles upon which television is being worked out?

Mr. FARNSWORTH. The early principles of television I conceived in the period from 1922 to 1927 are the system now adopted, fundamentally at least, throughout the world, and while our company has in no way been completely responsible for the development, nevertheless the fundamental ideas underlying it were the entire basis for our early research.

The ACTING CHAIRMAN. There are now other companies in the United States who are working on television also?

Mr. FARNSWORTH. Yes; there are many, and there are many in other countries, but this basic idea of no moving parts is common to

all systems, with the possible exception of one or two that are being used in the world.

The ACTING CHAIRMAN. Are there only a comparatively small group who are in your company, or has the stock been more or less open to the public?

Mr. FARNSWORTH. It has in no sense been open to the public. The diversification of the stock has come more through stockholders themselves trading around among themselves than it has been otherwise. The bulk of the money has been put up by very few stockholders.

The ACTING CHAIRMAN. So that the stock is mostly held within a comparatively small group of individuals.

Mr. FARNSWORTH. It is closely held and the majority of the stock is held by a very small group.

Mr. DIENNER. Mr. Farnsworth, I understand you developed a tube which produces radiation somewhat like radium. Is that correct?

Mr. FARNSWORTH. We have worked on a tube, the ultimate object of which is to produce very short radiation, very short X-rays, while not comparable with radium as yet but for the same purpose as radium, and also for producing very high velocity electrons.

Mr. DIENNER. That can be used for X-ray purposes, is that correct?

Mr. FARNSWORTH. Yes; it can be used as an inexpensive source of very short X-rays, corresponding to tubes of 1 to 5 to 10 million volts.

Mr. DIENNER. Going back to an earlier statement, you explained that the television of your conception involved no moving parts, no parts which had inertia. Will you please explain briefly what the difference is between having moving parts and having merely electron movement in terms of satisfactory operation?

Mr. FARNSWORTH. It comes down to the nature in which television must be accomplished, that is, the picture must be made up of points in a plane, the points having varying intensities, and the picture must be broken down and transmitted one point at a time. Then a complete picture must be transmitted in a comparatively short fraction of time, say, 30 times per second, 30 images per second, so that if we break down the picture into half a million units and transmit those 30 times per second, we have some 15,000,000 points of light per second which must be transmitted.

Not only that, but the tearing down process at the transmitter and the building up process at the receiver, while occurring at this enormous rate, must be synchronized so that the receiver and transmitter are doing the same thing at the same time, and that tremendously high speed of transmission is practically synonymous, it has been in my mind, with the lack of mechanical movement. So that in our system the fundamental idea is to translate an optical image into an electronic discharge corresponding to that image, because the electronic image can be deflected and moved and operated on almost without any inertial effects, without any mechanical lag, and makes possible this tremendously high rate of information transfer without involving too complicated apparatus.

APPLICATION FOR PATENT COVERING BASIC IDEA OF FARNSWORTH TELEVISION

Mr. DIENNER. And I understand that the patents and patent applications which you filed covered that concept and its application to television.

Mr. FARNSWORTH. Yes; the early application that was filed in the early part of 1927 covered the basic idea—it covered two basic ideas, conversion of the optical image into an electronic image and the scanning of that image in a linear fashion, much as a sheet of paper is typewritten—that is the generation of electrical impulses which transmit the image in a proper, orderly fashion.

Mr. DIENNER. Now in the course of your securing patent protection, did you encounter any interferences with other inventors?

Mr. FARNSWORTH. Yes; we have been involved in many interferences, the exact number I don't know, but since 1927 there has been to the best of my knowledge no time when we haven't been involved in interferences.

Mr. DIENNER. Approximately how many would you say?

Mr. FARNSWORTH. I should say 20 or 25 in all.

Mr. DIENNER. And some of those are still active?

Mr. FARNSWORTH. Yes; there are some of the interferences that are still active.

Mr. DIENNER. Tell us about what the first contested interference cost you and your backers?

Mr. FARNSWORTH. One of our interferences, I think it was the second one, cost the company approximately \$35,000, somewhat of that order, perhaps more and perhaps slightly less, but it was very close to \$35,000.

Mr. DIENNER. Did you win it?

Mr. FARNSWORTH. We won that interference; yes.

Mr. DIENNER. And you had further interferences beyond that?

Mr. FARNSWORTH. Yes; we have had, as I say, continual interferences in other matters.

The ACTING CHAIRMAN. If I may ask, do any of these interferences involve the fundamental principles of your idea?

Mr. FARNSWORTH. The interference to which I referred as costing \$35,000 involved the basic idea of converting an optical image into an electrical image and forming a train of television signals to correspond to the electrical image.

The ACTING CHAIRMAN. And that has been cleared up?

Mr. FARNSWORTH. It has been cleared up.

Mr. PATTERSON. When was the first public demonstration of electronic television?

Mr. FARNSWORTH. The first public demonstration was at the Franklin Institute in 1934. That demonstration lasted about 2 weeks, at which time we televised all kinds of scenes from outdoor pictures to pick-up of the parkway in Philadelphia, the transmission of night club scenes—in fact, we generally raised hob with the dignity of the Franklin Institute for a period of 10 days.

Mr. PATTERSON. You are talking about the Farnsworth Television Corporation.

Mr. FARNSWORTH. This was the Farnsworth television demonstration.

Mr. DIENNER. Have you been involved in any litigation in regard to the patents, I mean suits on patents aside from the interferences?

Mr. FARNSWORTH. Not aside from the interferences.

Mr. DIENNER. The money which was put into that first contest that cost you \$35,000 had to come out of your backing and not out of earnings, is that correct?

Mr. FARNSWORTH. Yes; there were no earnings. It means just that much money diverted from research.

Mr. DIENNER. So interference in your case was a very severe trial on the hopeful enterprise which had reached the commercial stage.

Mr. FARNSWORTH. Yes, it was. It meant getting along without some engineers, or stopping research on some particular phase in limiting our activities to the extent of \$35,000.

Mr. DIENNER. It detracted from your work by compelling your attention to the contest, I assume.

Mr. FARNSWORTH. Yes; it also took time of myself and our patent department which could have well been devoted to the problem of development and filing of new applications instead of contesting interference proceedings.

Mr. DIENNER. About how long did that interference run, as you recall it?

Mr. FARNSWORTH. As I recall, it ran approximately 2 years.

Mr. DIENNER. I believe you stated that you had developed various collateral inventions or byproducts of your main pursuit. Tell us briefly, if you can, what the general nature of those is.

(The chairman, Senator O'Mahoney, resumed the chair.)

Mr. FARNSWORTH. They relate to electronic tubes that have been required for amplification or for other purposes, for carrying out the television process, and invariably where a new tool is developed which improves television, it has improved something else, some other field. These sensitive multiplier amplifiers are one type, the possibility of an inexpensive hard X-ray source is another, the translation of images from invisible light to visible light are another field; the electron microscope is a field which we have gone into somewhat.

Mr. DIENNER. Could you show us some samples of the tubes which you have produced and tell what they would do?

Mr. FARNSWORTH. I have brought with me the two tubes that are important as they are evolved at present in the television transmitter, and I have in addition brought along three electron multiplier tubes, one evolved for moving picture and bean counting and lemon sorting, and the other for photometry where extreme sensitivity is necessary, and another that is important in generation of extremely short-wave length.

Mr. DIENNER. Would you like to see the tubes?

The CHAIRMAN. I am sure the committee would be interested in seeing them.

Mr. FARNSWORTH. This is the tube that I described that would detect a candle 10 miles away.

The CHAIRMAN. There is another tube in front of the candle, isn't there?

Mr. FARNSWORTH. No.

The CHAIRMAN. You mean to say this instrument of itself could be so operated that it could segregate the light of a candle 10 miles away?

Mr. FARNSWORTH. It could tell you whether you had your hand in front of the candle or not. In other words, that merely indicates the lower amount of light that is necessary to show measurable effect.

The CHAIRMAN. You would probably have to go out to Utah to get the open space to do it.

Mr. FARNSWORTH. You have to find some place to get rid of extraneous effect, but if you are pointing a telescope at a star you have those conditions.

This is a tube for production of extremely short waves. It is a true cold cathode tube. The electrons originate from no place. The electron multiplies so high that we don't need to find where the first waves come from.

Mr. PATTERSON. Will you at the proper time tell us some of the proper applications of this tube (referring to the first tube displayed)—the potential applications?

Mr. FARNSWORTH. This tube is the modern camera tube for direct pick-up. This tube promises—it hasn't done it as yet but theoretically it is possible to televise a scene with so small an amount of light on it that it can't be seen.

Mr. DIENNER. The image appears on the end of this "potato masher"?

Mr. FARNSWORTH. No; this is the transmitting tube. The image is focused by means of lens onto the photoelectric screen which is a part of it.

Mr. DIENNER. In other words, that looks at the televisior equipment, so to speak.

Mr. FARNSWORTH. Yes; that corresponds to the film in the camera. This is a simple electron multiplier.

Mr. DIENNER. I believe Secretary Patterson asked what the potentialities of the first tube were that could detect the light of a candle 10 miles away.

Mr. PATTERSON. Yes, that is right, Mr. Dienner, I asked Mr. Farnsworth if he would kindly tell us the practical applications of the first tube, and maybe some of the potential applications—that is the 10-mile candle tube, I will call it.

Mr. FARNSWORTH. I can only indicate the field of use where this is now being applied. First, I will say that many of the fields where this is being used is confidential work of other inventors. In other words, we have furnished a tool here that they are very anxious to apply, but some of them don't tell us what it is for.

But in any field where an extremely small amount of light is to produce some useful effect, it can be used. You might use it for opening your garage door but you would only go to the trouble of using this tool if you wanted to flash your flashlight on it while you are half a mile away. In other words, a very much simpler tube would serve this purpose.

This little tube which I am passing around here is for talking-motion picture use, the same sort of tube except not so elaborate and that might be used for opening the doors of a railway station, in which case it would eliminate a costly head amplifier that goes along with it. This would directly operate the relays which open the doors.

And both of these tubes are photocells with the amplification within them and not on the outside. This particular tube is used for color comparator work, for monochrometers, for stellar photography, and all of the possible industrial applications that are included in those.

Mr. DIENNER. That includes the lemon sorting and bean sorting?

Mr. FARNSWORTH. We designed a particular model here for lemons.

This tube is the early dissector tube, the fundamental idea of which was evolved when I was a kid in high school, but it is not by any means

the invention of that high-school age. As a matter of fact, it involves 20 or more separate inventions and is the final product of a fairly good research laboratory.

Mr. DIENNER. Before you pass it to the committee will you tell briefly how it operates or what it does?

Mr. FARNSWORTH. In this tube the image to be transmitted is focused onto this silver plate here, which has the property of emitting electrons.

The CHAIRMAN. How is it focused?

Mr. FARNSWORTH. It is focused through this clear window, the window in this end of the tube.

The CHAIRMAN. In other words, that is pointed at the image which it is desired to televise?

Mr. FARNSWORTH. It is placed behind the lens. An optical lens picks up the image, a regular photographic lens, and focuses it on this cathode, this being in the plane of the image as though it were a film in the ordinary camera. The electron emission from this cathode is drawn in this direction by an electric field and focused by means of a magnetic lens so that in this plane here we have the electrical counterpart of this image here.

Taking a cross-section of the electrical image there, it corresponds in electrical intensity to the light intensity of the corresponding plane back here. A small portion of that is picked up by a tiny aperture in the shield, this metal shield which you can see through here, and that registers then, or records, the electrons from one particular area in this image back here. Then, by means of deflecting magnetic fields we can sweep this over the image in a fashion, any desired scanning fashion. The way we do it is the manner in which you would type a page of script, but at a very high rate. It scans the entire image in one-thirtieth of a second, and in that time draws 441 lines across this image in the back.

Inside this little shield is this tube, reduced. That is, exactly the same number of elements you see in this tube are positioned inside this small tube here, and it amplifies the electrons entering the aperture. The portion of this electron picture selected is amplified by a factor in this tube 100 times before it enters the conventional amplifiers that are external to the tube.

The CHAIRMAN. Is this the same principle as that by which the news associations today transmit photographs, except that they do it by wire, and this does it by radio?

Mr. FARNSWORTH. They do it mechanically. If they could speed up their apparatus 10,000 times they would accomplish practically the same result that this tube accomplishes. They wrap a photo negative around a cylinder, very much as the old Edison cylindrical phonographs did, and transmit the impulses in the receiver and there, by a light belt, change the impulses back to light and record it photographically or otherwise.

The CHAIRMAN. In other words, the principle, the transmutation as it were, of an optical image into an electrical image, and the transmission of an electrical image either by wire as the news photographic associations do, or by radio, as yours does.

Mr. FARNSWORTH. With one exception. The news system does not convert to an electron image first. It tears the picture down and converts it into a train of signals which go over a wire. We do it so we

can make this wheel draw 441 lines in one-thirtieth of a second, instead of approximately that number of lines in 7 or 8 minutes.

The CHAIRMAN. When you draw the line you pick up the electrons just as the other machine picks up the impulses.

Mr. FARNSWORTH. Picks up the light and converts it into electrons.

Mr. PATTERSON. What is the name of this tube?

Mr. FARNSWORTH. The image dissector tube, or the dissector multiplier.

Mr. PATTERSON. And it is designed primarily to transmit motion pictures, but it can be applied to other uses?

Mr. FARNSWORTH. It is not the tube we propose for that purpose. The other tube is the one we use for direct pick-up. That tube is standard equipment in half a dozen different television systems now.

IMPOSSIBILITY OF OBTAINING FINANCIAL BACKING WITHOUT PATENT SYSTEM ¹

Mr. DIENNER. Going back to your main problem of getting under way, how does it seem possible, without calling on the patent system, to get such an enterprise started?

Mr. FARNSWORTH. Why, without the patent situation I don't see any hope of starting any such an enterprise. Certainly no one can be expected to subscribe such a large amount of money without having it protected; without having a basic reason for so doing and without the money, without this order of money, no such development—well, there is no point in ever starting any development of that magnitude.

Mr. DIENNER. And if, after getting your patents, you had to grant licenses to others on demand, do you suppose you could have gotten the backing?

Mr. FARNSWORTH. If we had to grant licenses on demand the value of the patent would be so materially decreased that we might just as well not get a patent.

Mr. DIENNER. I understand you have relations with other companies. Have you any cross licenses with any company?

Mr. FARNSWORTH. We have a cross-licensing agreement with the American Telephone & Telegraph Co., we have licensing arrangements with Fernseh and Baird in London.

Mr. DIENNER. You heard the testimony of Dr. Jewett yesterday regarding the electron tube used on the Bell telephone lines.² A question was raised as to why a tube of the same long life and small current consumption is not furnished to the public. Will you please explain what the facts of the situation are?

Mr. FARNSWORTH. The telephone company, I think, made the reason for their long life tube very clear; the necessity for reduction of operating costs and the fact that the desired characteristics of the tube could be so completely specified made possible the long life which they have achieved.

In radio, there are two points that were brought out, one that the tube uses less filament power, less heating power or operating power, and therefore results in economy where there are so many of them used. That was perfectly true. That is perfectly true, that it did at the time evolved use much less power. It doesn't, however, use

¹ This subject is resumed on p. 1075, *infra*.

² *Supra*, p. 953, *et seq.*

less power than modern radio tubes, of which there are many models actually using less.

The question as to why 50,000 hours of service is not used for radio tubes can be well understood if you remember that there are in current use from 75 to 200 different types of radio tubes which must be kept available to the radio set owners because of the very rapid development of radio. Receivers sold 7 years ago or 10 years ago must still get tubes in some way, and those tubes, even though rendered obsolete by later developments, still have to be capable of production.

As a matter of fact, radio tubes have been made with life approaching the 50,000 hours, and certainly could be made available if the public desired them. The fact of the matter, in my opinion, is that the public demand for such a tube does not exist, for the very reason that the rate of obsolescence in radio tube sales is such that from 12 to 25 new tube models appear every year, and actually, the obsolescence in radio amounts to a complete set of tubes a year. I know of several models of tubes which are capable of 10 to 12 thousand hours of service. The fact that a longer life tube is not available is in no way an attempt to evade public demands. If the public demanded a 50,000-hour tube they could have it. As a matter of fact, our company is licensed to make that tube and knows how to make it. There are perhaps 10 or 12 other licensed radio manufacturers who also can make that tube.

The CHAIRMAN. By whom are you licensed?

Mr. FARNSWORTH. By American Telephone & Telegraph. We can manufacture anything directly not competing with telephone apparatus under any of their patents.

The CHAIRMAN. Is there any other limitation upon the use of that license?

Mr. FARNSWORTH. To the best of my knowledge, no. The limitation is simply that we must not compete in telephonic service with Western Electric.

The CHAIRMAN. Is there any limitation upon the amount of production or anything of that kind?

Mr. FARNSWORTH. No limitation as to the amount of production. I should say none.

The CHAIRMAN. Any control as to price?

Mr. FARNSWORTH. No control as to price.

The CHAIRMAN. So that you conceive yourself to be free to use this, except not in competition—

Mr. FARNSWORTH (interposing). We couldn't supply telephone repeaters, but we have no intention of attempting to produce such a tube because the present production of radio tubes, the evolution of the radio-tube policy, hasn't been haphazard by any means. It has been to meet public demand. I don't believe there is any market for a 50,000-hour tube, because nobody wants a tube that will last 50 years in a radio. Their set becomes obsolete after perhaps 10,000 hours, and if they want a tube which will last 10,000 hours they can get them.

Mr. DIENNER. You mean they are on the market now?

Mr. FARNSWORTH. They are on the market now.

Dr. LUGN. In making up such a tube, would any other patents than the Bell patents be involved?

Mr. FARNSWORTH. I doubt if at the present time any patents would be involved. That work is almost all expired art. I am speaking now of art represented by work of Nicholson and Dr. Arnold, and vacuum technique, most of which is expired art, so that even the unlicensed companies could make such a tube.

Mr. DIENNER. Mr. Farnsworth, what was the first experience of any member of your family with the patent system?

PATENTS ON USELESS INVENTIONS

Mr. FARNSWORTH. My father, who made a very small amount of money and to whom the amount of money which I will mention represents perhaps 3 or 4 months' savings, put up in 1924 a sum to the extent of \$150 to finance an invention of mine indirectly concerned with television. That is, I visualized it as a way of getting money to go on with my television work. I had contact with a certain nationally known patent attorney. The application which I got seemed to be in very good order, beautiful drawings, beautiful specifications; as I regard the patent today, totally useless. It was an idea not worth patenting. It should have been told to me that it was not worth patenting, and the fact that it was patentable can certainly be said of almost anything you can conceivably think up. There is certainly some kind of claim you can get on it.

I think that that type of practice on the patent attorney's part represents a very questionable part of our patent system, and unfortunately is the part which brings in the inexperienced inventor, and the inventor of very meager means.

The CHAIRMAN. You mean that the patent attorneys use their art in phrasing claims for ideas to induce inventors to prosecute the patent, ideas which are useless and which the patent attorney himself must know are useless.

Mr. FARNSWORTH. Certainly anyone with any experience could know that the patent he obtains is worthless.

Representative REECE. My experience has been, if I may say so, that most of the people who invent something become very enthusiastic about it, though it may not hold any great promise in the minds of others who might have opportunities to look upon it.

The CHAIRMAN. I was going to say that I have a little experience, too, Congressman, with respect to the attitude of inventors or those who conceive themselves to be inventors. I suppose to every Member of Congress there come hundreds of letters from persons who think they have ideas that will save the world in one way or another. It is ordinarily the thought of these persons that somebody is waiting around the corner constantly to steal the idea, and I am sure if an attorney told such persons that the idea was impractical those persons would immediately come to the conclusion that the patent attorney was trying to steal their idea and they would go to somebody else.

I have had dozens of letters which clearly indicated a belief upon the part of the person who had conceived the idea that unless he was very, very careful, somebody was going to steal it away from him. They exercise the greatest caution in being referred to attorneys. My letters read, "Can you suggest to me an attorney on whom I can rely?" and I am frank to say to you that I know of no attorney practicing

law in Washington upon whom the inventor couldn't rely to prosecute his claim honestly and fairly and exclusively.

Representative REECE. And you are rather cautious yourself, are you not, to keep yourself in a position where you might not be suspected of becoming a part of the conspiracy?

Mr. FARNSWORTH. I can well understand that. I am accused of stealing ideas and inventions and everything else, from inventors who are jealous, just afraid that they are going to have their inventions stolen, but so long as we have the present interference practice it is important that such inventors get a record. If we can save 1 out of 100 inventors, if some system can be worked out so that they will make a record of their notion. We will never get rid of the nut inventor. That is a confliction in terms.

The CHAIRMAN. I was just coming to the defense of the patent attorney. I don't know how you can very well avoid the issuance of patents upon useless devices. I doubt very much whether the patent attorney as such could be held responsible for it.

Mr. FARNSWORTH. No; they unfortunately can't. That is why they are able to operate a business approximating fraud, approaching fraud. You may not know of any such attorneys in Washington, but I do, and so does everyone else who deals with patents. That seems a rather strong statement, but there is a distinction between those who attempt to give an appraisal of a possible patenting of an idea with some possible merit, and those who get a patent, no matter whether it is good, bad, or indifferent. In other words, the search is totally useless in such cases.

The CHAIRMAN. Well, if there are fraudulent practices in the prosecution of patents before the Patent Office, that certainly is a subject which ought to be thoroughly examined by the Patent Office or maybe eventually by some committee of Congress. I don't know that it is really part of the functions of this committee, working on a much broader subject.

Mr. FARNSWORTH. I have said all that I want to say on that subject.

The CHAIRMAN. Fraud in the prosecution of patents is certainly a subject of great concern to the public and to the law profession, I would say.

Representative REECE. If I may venture to express an opinion, I should doubt, in my present state of mind, the advisability of the patent attorney undertaking to pass upon the utility of a patent or idea that was sought to be patented. As was brought out earlier in the hearings on this question, sometimes an idea might look utterly futile, useless, but turns out to be a very valuable idea. That isn't always the case, but sometimes it is the case, and if an attorney assumed the responsibility of passing upon the utility of a patent, and then someone else got a patent on the idea, and it turned out to be of value, he would be left in a very untenable position, it would seem to me.

Mr. FARNSWORTH. I recognize, of course, the difficulties of the situation. That is why it is there.

The CHAIRMAN. Commissioner Coe, you look as though you wanted to say something.

Mr. COE. I will be very brief, but I think I should make a few remarks right at this particular moment. I agree with Congressman

Reece that the function of a patent attorney is to advise an inventor as to whether or not he can obtain a patent, and it seems to me that the case that the witness is complaining against really vindicates the patent attorney, because his judgment turned out to be correct. He did get the patent.

The Patent Office has what I think is one of the most effective controls over its attorneys of any Federal bureau. We have a Committee of Enrollment and Disbarment; we receive and take testimony and have hearings on every complaint registered by any inventor or patentee against any attorney. We frequently disbar attorneys when fraud has been indicated. So at the present time we are exerting every possible means in protecting the inventor.

In the last session of Congress the Patent Office suggested and the Congress passed a law that was designed wholly for the purpose of protecting inventors against any attorney who misrepresented his status or who in any way took advantage of the inventors to their detriment.

Mr. DIENNER. Mr. Chairman, I think we ought to bring out the fact that there was a relation between a popular magazine and the present point. Was that the fact, Mr. Witness?

Mr. FARNSWORTH. What was that?

Mr. DIENNER. I think we ought to bring out the fact that there was a relation between a popular magazine and the point under discussion, and I was asking you whether you would bring that out. That is, where did your father learn of the particular attorney whose services he employed?

Mr. FARNSWORTH. Yes; that was through a nationally advertised mail-order attorney.

Mr. DIENNER. And you think that does not fairly give the inventor show for his hard-earned money?

Mr. FARNSWORTH. I don't think it does. I think that it presents a situation against which the inventor needs to be protected.

Mr. DIENNER. That is particularly the boy on the farm.

Mr. FARNSWORTH. Yes; the inventor with very limited means and with only a vague idea as to what kind of a thing a patent is, what kind of protection he is supposed to get.

Mr. DIENNER. Mr. Chairman, the witness's examination is complete from my standpoint.

The CHAIRMAN. Do any members of the committee have any questions?

Dr. LUBIN. Mr. Farnsworth, I was very much interested in your statement a few minutes ago to the effect that if you were compelled to license other people to use your patents the value of your patents would automatically disappear and there would be no further stimulus for going on with your work. I was interested in that comment and I wish you would develop the idea. To me it appears that if, for instance, you could fix any reasonable royalty that you wanted to fix, there still would be a tremendous stimulus to activity, would there not?

Mr. FARNSWORTH. Yes; but when you say "fix a reasonable royalty," what is reasonable becomes so vague as in effect to nullify the arrangement; in other words, to make it unnecessary to license anyone who wants a license. In other words, manufacture for own use is prevented. When you undertake a given development you don't know whether you will want to give licenses on that development or

not, or make it available to the public yourself, or be entitled to manufacture it yourself.

Dr. LUBIN. Do you issue licenses to anybody?

Mr. FARNSWORTH. We issue licenses on a uniform basis.

Dr. LUBIN. Are they available to anybody who wants them on that basis?

Mr. FARNSWORTH. That is the intent of our policy, to make it available to everyone on the same basis. Now there must obviously be a few exceptions to that, people who aren't qualified.

Dr. LUBIN. Would you feel that a system whereby anybody who does license patents should be compelled to license anybody else on equally equitable terms would be a deterrent to further invention?

Mr. FARNSWORTH. If you could interpret what you mean by equally equitable terms. The situation gets so much more complicated than that when, for example, someone may be interested in a particular field and be much better suited to manufacture that than anybody else. They may be willing to undertake development on their own part and there may be a thousand and one other factors which make it appear that you are giving them a preferential license, when, as a matter of fact, when all factors are taken into consideration, the license is no better.

Dr. LUBIN. You may not want to commit yourself, and if you don't care to let's forget about it, but I would like to ask this question: Would you favor legislation which would compel licensing in the event that licenses had been issued to any particular person; in other words, once a license has been granted, to make such licenses available to other people?

Mr. FARNSWORTH. Well, I don't know, frankly, offhand whether I would favor that or not.

Dr. LUBIN. I don't want to press it.

Mr. FARNSWORTH. That is one I would have to think about.

The CHAIRMAN. You think that a system of compulsory licensing would have a tendency to enable large aggregations of capital to compel individual inventors to subject their devices to the desires and purposes of the large aggregation?

Mr. FARNSWORTH. Yes; I am afraid it would. That would be one of the evils of it, in my opinion.

The CHAIRMAN. In other words, compulsory licensing would extend to promote concentration rather than break it down.

Mr. FARNSWORTH. Yes; if I could be forced to allow a railway company to cut off this corner of my property or that corner of my property, and had no recourse outside the law, I wouldn't have a very valuable piece of property.

ALLEGED SUPPRESSION OF PATENTS IN TELEVISION FIELD

The CHAIRMAN. Mr. Farnsworth, I suppose my experience is that of other members of the committee and other members of Congress, that there seems to be in the public mind a feeling that if there is any suppression of patents, it is in the field of television. Is there any basis for that feeling?

Mr. FARNSWORTH. I most assuredly think there is not. I don't know of any suppression of patents as such in any field, to my personal knowledge.

The CHAIRMAN. The thought which is expressed most frequently is that there is such a large investment in the present radio field, and in various fields that are subordinate and contributory to it, that there is a desire on the part of those who control radio not to permit television to come into public use as soon as it might otherwise do. Is there any basis for that?

Mr. FARNSWORTH. No; except in this respect. When television standards are adopted it so freezes the art that we must be very sure before the standards are adopted and made available to the public that we aren't delaying ourselves by years and years and years by the very starting of the service too quickly, and I think that anything that might be interpreted as a desire to suppress invention or to hold it back from the public has been a natural desire to see that it be properly organized and the industry properly planned before commitments are too strong.

Personally, I think it has been carried to an extreme, but I am willing to grant that some holding back is necessary in the interest of the public, as well as the interest of the workers in the field.

The CHAIRMAN. There has been some holding back for this purpose?

Mr. FARNSWORTH. For the purpose of knowing when we standardize on so many images per second and one wave band here and sound up on top and vision down below on the carrier, making receivers which will pick up all kinds of transmission with one type of receiver—well, it represents an enormous engineering problem and one which as a committee in the Radio Manufacturers Association we have worked hard on for 3 years.

The CHAIRMAN. Has the art of television been developed as yet to that point where it would be possible to install a receiver in your home which could receive various kinds of transmission?

Mr. FARNSWORTH. Yes; it has. It has been developed to standards which are tentatively agreed on, which will make it impossible for you to tell from which kind of transmitter the signal originates.

The CHAIRMAN. What kinds of pictures can be transmitted by the present system of transmission and reception on one instrument?

Mr. FARNSWORTH. What kind of subject material?

The CHAIRMAN. I am talking now about the reception instrument. What kinds of pictures, studio pictures or pictures in the field?

Mr. FARNSWORTH. Outdoor pictures of news events, scheduled sport events, indoor studio pick-ups, stills for purposes of advertising, back projection, and motion-picture film—the whole scope of television.

The CHAIRMAN. In other words, you can divide pictures which are desirable to transmit into two types, broadly speaking, I would say. One is the studio type where the scene is enacted before the camera or the lens, and the other the outdoor type in which a scene proceeds which is not rehearsed, which may go any way.

Mr. FARNSWORTH. The television is incidental to it.

The CHAIRMAN. Now, either one of those can be transmitted today?

Mr. FARNSWORTH. Either one of those may be transmitted by Farnsworth today.

The CHAIRMAN. And you have a reception machine which can take either one of those.

Mr. FARNSWORTH. And the signal sent out is not any different in either case. One reception device gets them both.

The CHAIRMAN. Would a picture of a baseball game, let us say, or the landing of a distinguished visitor at the dock in New York—would that picture be clearly reflected upon the screen of the reception instrument in the home?

Mr. FARNSWORTH. Yes. I will be glad to show you what the picture does look like. I have photographs of a girl on a bicycle. That will be clear there, a totally flickerless picture, a steady image, and I have heard it remarked many, many times that the picture could not be told from a motion picture if they hadn't known it was television.

The CHAIRMAN. In other words, a perfectly satisfactory image can be shown on the reception instrument.

Mr. FARNSWORTH. Yes.

The CHAIRMAN. Now, then, if that is the case, why is it not on the market?

RADIO MANUFACTURERS ASSOCIATION TELEVISION STANDARDS COMMITTEE

Mr. FARNSWORTH. Again we have the tremendous preparation necessary to get broadcasting under way and receiver production scheduled. Receivers will be sold this year. We hope to go to the Federal Communications Commission as the R. M. A. standards committee and say "We have reached the standards and are ready to go ahead. Do you think it is ready for commercial use?" We hope their answer will be "Yes."

The CHAIRMAN. When you say "we" whom do you mean?

Mr. FARNSWORTH. I mean the engineering committee of the Radio Manufacturers Association.

The CHAIRMAN. Would you care to show those photographs now?

Mr. FARNSWORTH. Yes; I have those right here.

Mr. DIENNER. Mr. Farnsworth, might there not be some interference with present radio channels in placing television on the air?

Mr. FARNSWORTH. There is an enormous problem there of putting out these tremendously wide television bands, working them in an already overcrowded ether spectrum. The Commission has tentatively planned to give seven channels.

The CHAIRMAN. So there are interferences in the ether as well as in the Patent Office.

Mr. FARNSWORTH. There certainly are. There are problems of trying to find space for this new service with the short-wave spectrum expanding so rapidly.

The CHAIRMAN. You referred to the Radio Manufacturers Association. How many members are there of that Association?

Mr. FARNSWORTH. As a matter of fact, our company is not a member. I have been invited to serve on that committee. Any time that activity appears in the television field that technical committee requests the engineers or the company to participate.

Mr. PATTERSON. Who constitutes the Radio Manufacturers' committee on standards?

Mr. FARNSWORTH. The personnel?

Mr. PATTERSON. Yes.

MR. FARNSWORTH. There is Chairman Albert F. Murray, of the Philco Radio Television; Mr. Engstrom, RCA Victor; Dr. Goldmark, Columbia Broadcasting System; a member of General Electric Co.—I have forgotten just offhand who is the official representative for General Electric; our own company is represented; the National Broadcasting Co. is represented; the Allen Dumont Laboratories have recently joined, and in general the attempt is to include representatives of all active work in television.

MR. PATTERSON. Is their decision on standards the last word?

MR. FARNSWORTH. It is not the last word by any means, no, but it is so far the only committee that has seriously undertaken the problem of getting the various workers to agree on proper procedural methods.

THE CHAIRMAN. These are all independent workers?

MR. FARNSWORTH. They are all independent except they are tied together on the committee.

THE CHAIRMAN. Could one of these workers undertake to proceed in marketing the television enterprise without the consent of the others?

MR. FARNSWORTH. It could, it definitely could, but if it did it would be probably faced with production of four-fifths or nine-tenths appearing some place else on a different standard, and it couldn't hold out. It is purely an informal arrangement but nevertheless still effective.

THE CHAIRMAN. In other words, the importance of agreeing upon a standard is so great that these independent enterprises are cooperating rather than competing.

MR. FARNSWORTH. Yes. They recognize the very future of television depends upon close cooperation in adopting the standards.

THE CHAIRMAN. Now, then, am I to understand that there are television companies which control the art, several different companies which control the art, I mean so far as the use is concerned, for themselves?

MR. FARNSWORTH. As regards patents, I think you mean now?

THE CHAIRMAN. First as regards patents and then secondly as regards any other method of control.

MR. FARNSWORTH. I might say there that the principal research in this country has been done by our laboratories, the RCA laboratories, and the Philco laboratories, that is as regards the production of broadcasting of television. The Bell Laboratories have been responsible principally for the coaxial-cable development, and there are other laboratories that are getting into television now concerned with the application of it more than they have been in its development prior to a few years ago.

THE CHAIRMAN. No patent then excludes them from getting in? Is that the idea?

MR. FARNSWORTH. Their licensing policy, as with the RCA company, is included in the radio license, so that all of the licensees for receivers, for example, have a license to manufacture RCA television receivers. Our only licensees for television receivers are the Philco Co. and the Bell Telephone Laboratories.

THE CHAIRMAN. How many different types of television receivers are there?

Mr. FARNSWORTH. There are just as many as there are workers, but essentially they are all the same thing.

The CHAIRMAN. These different receivers, however, are all based upon the same patent, are they?

Mr. FARNSWORTH. The same system of patents, our own patents, the RCA patents, the Bell Telephone patents.

The CHAIRMAN. And then these different receivers are possible because of the licensing system which enables different companies to develop their own particular type.

Mr. FARNSWORTH. Yes; their own particular application.

The CHAIRMAN. These types are not essentially different?

Mr. FARNSWORTH. In any fundamental way they are not different.

The CHAIRMAN. That is, the differences are merely incidental.

Mr. FARNSWORTH. Engineering preference.

The CHAIRMAN. The Philco television receiver would not be any less effective than your television receiver.

Mr. FARNSWORTH. It would not be any less effective unless possibly they didn't do a good job designing it. There is no fundamental reason why it shouldn't be just as good.

The CHAIRMAN. In building.

Mr. FARNSWORTH. Yes.

The CHAIRMAN. But is there any patentee which controls the patent by which these television receivers are constructed?

Mr. FARNSWORTH. It is not possible to build a television receiver without working under our patent; it is not possible to build a television receiver, in my opinion, without working under RCA license.

The CHAIRMAN. What is the difference between your license and the RCA license?

Mr. FARNSWORTH. It covers a different—well, you see this art has grown up so interwoven that part of the patents belong to RCA, part belong to us, part belong to Bell Telephone.

The CHAIRMAN. But the fundamental patent is yours.

Mr. FARNSWORTH. Several of the fundamental patents are ours and I think several of the fundamental patents are RCA's also.

The CHAIRMAN. Then to get the perfect result, all of these fundamental patents must be worked together.

Mr. FARNSWORTH. They must; yes; they must be regarded as a unit.

The CHAIRMAN. What are the restrictions that are contained in these various licenses?

Mr. FARNSWORTH. As far as we are concerned we are not attempting to control an industry, we don't think that is our function, but one limitation is that there are no exclusive licenses, we won't grant any exclusive license. There is no attempt to fix price. Rates are made small because we believe in that, and there is no restriction in an attempt to control the industry.

The CHAIRMAN. What restriction on your licensees?

Mr. FARNSWORTH. They are restricted because they have to pay us a royalty.

The CHAIRMAN. Do we understand, then, that practically the sole purpose of your licenses is to secure a royalty for your company?

Mr. FARNSWORTH. Yes; that is the sole reason.

The CHAIRMAN. And you do not use the license in any way to restrict the development of the industry?

Mr. FARNSWORTH. No.

The CHAIRMAN. Does anybody who holds a license in this field in your opinion use the license for that purpose?

Mr. FARNSWORTH. In my opinion, no; because if they did they would be very foolish to constitute themselves a policing agency.

The CHAIRMAN. Do you wish the committee to understand that the development of television is as free as it can be within the limitation of the general purpose not to bring it into public use before the standard has been sufficiently developed to prevent freezing the art?

Mr. FARNSWORTH. Yes. It is my contention that the only thing holding back television is its own problems of getting it under way.

The CHAIRMAN. Do you know of any person in the television field who might not agree with the conclusions which you have expressed here in answer to my questions?

Mr. FARNSWORTH. I don't know of anyone. I should certainly like to know of anyone and I would attempt to convince them otherwise.

The CHAIRMAN. That is, you haven't heard of any complaint from any person who knows of any attempt to suppress or restrict the development of this art?

Mr. FARNSWORTH. No. At least nothing coherent. I have heard mumblings, perhaps, but no coherent complaint has come from anyone that I know.

The CHAIRMAN. Are there any other questions to be asked?

Mr. PATTERSON. Mr. Farnsworth, before you leave the stand, you testified this morning that since 1926 you have put 12 years of labor into your corporation, and approximately a million dollars has been spent, and you hope for your profits in the future. Has not your incentive to go forward been based on your patent protection?

Mr. FARNSWORTH. Yes. It has been based on the value of the inventions both as represented in technic and in patents, but obviously the technic is necessarily more or less a secret part of the asset, whereas the patent is the only really legal evidence aside from the result that we have, and our patents measure the extent of our success.

The CHAIRMAN. It wasn't the desire to get a patent that first started you out as a boy of 12?

Mr. FARNSWORTH. No; but I regarded a patent as a necessary adjunct to it, even at 12.

The CHAIRMAN. Don't you think it is likely that you would have proceeded with this great desire you had regardless of the patent system as such?

Mr. FARNSWORTH. I don't doubt it, but even then the patent situation influenced or colored the type of disclosures I made. I attempted to keep the whole world from knowing that I was an inventor just as long as I could, and I would counsel any young inventor to do the opposite. He had better run a chance of having his work stolen than not to get more help on it and be more open on it. I think that the impression in the whole United States of the necessity of secrecy in inventions in the fact that somebody is likely to steal this and steal that works backwards.

The CHAIRMAN. The patent system which affords protection to the inventor so far as it does afford that protection is the instru-

mentality, as it were, or the means by which discoveries may be broadcast and made eventually useful to the whole public.

Mr. FARNSWORTH. Yes, it is; it constitutes the basic guiding system.

The CHAIRMAN. So you think the patent system should be improved so far as it can be improved to give greater protection to the inventor for the period in which protection should be granted.

Mr. FARNSWORTH. A streamline situation just as much as possible, improve it as much as you can without changing it basically.

The CHAIRMAN. And improve the strength of the patent so that its validity may be more certain than now.

Mr. FARNSWORTH. Yes; and then make it easier for independent inventors of small means to compete with companies who have arrived because there is where the valuable material originates. It won't arrive in our laboratory from now on; it will be a perfection of art, which is very important, but fundamental ideas which require the patent situation most basically and most urgently are those which originate in the small laboratories.

The CHAIRMAN. Out of your experience have you any suggestions to make to this committee as to the manner in which the individual inventor can be protected as you have just described against the large corporation?

Mr. FARNSWORTH. Well, only in such small particulars as could at least be better handled by the patent attorneys, such as printing of certain documents and simplification of interference procedure, and so forth.

The CHAIRMAN. Are there any other questions?

Representative REECE. If you know, I think it would be interesting, not that it has any particular bearing on the question, for you to state how you became interested in this question. We hear a great deal said about the inventor being born, not made. I think it would be interesting to know how you happened to get started to thinking along this line, since this is a more or less new field.

Mr. FARNSWORTH. Why, it is difficult for me now to make an accurate guess as to what originally got me started. I invented perpetual motion at the age of 6—I don't know whether that means anything. I studied everything I could get hold of in the way of aviation magazines, and I was reading relativity at the age of 13, and while I learned the words I believe at that time I knew just as much about the subject as the author who wrote the book because he only knew the words. [Laughter.] It is an intriguing art. I believe I had decided before I was 12 that I could be an inventor. It was my grand secret and therefore I just worked on it, night work, pleasure, which probably led to certainly the invention of the dissector tube, which came right out of the air in a second as soon as I knew enough to understand that an electron was an entity; in other words, with the actual discovery in my life of an electron, perhaps more accurately the photoelectric effect, I had the basis on which to go ahead.

The CHAIRMAN. If there are no other questions the committee will stand in recess until 2 o'clock.

(Whereupon, at 12:10 p. m., a recess was taken until 2 p. m. of the same day.)

AFTERNOON SESSION

(The committee reconvened at 2:25 p. m. at the expiration of the recess.)

The CHAIRMAN. Mr. Dienner.

Mr. DIENNER. Senator, the witness we now produce is a man of wide and expert knowledge of the laws relating to patents on inventions in the various countries of the world. His testimony will give us a new and I believe very helpful light upon questions raised before this committee as to the operation of certain provisions of the laws in the chief industrial countries in Europe.

Mr. Langner, will you please be sworn?

The CHAIRMAN. Do you solemnly swear the testimony you are about to give in this proceeding will be the truth, the whole truth and nothing but the truth, so help you God?

Mr. LANGNER. I do.

TESTIMONY OF LAWRENCE LANGNER, MEMBER OF LANGNER, PARRY, CARD & LANGNER, PATENT ATTORNEYS, NEW YORK CITY

Mr. DIENNER. Will you please state your full name and your professional connections?

Mr. LANGNER. My name is Lawrence Langner. I am the senior partner of Langner, Parry, Card & Langner, of New York City, and I practice as an international patent solicitor.

I passed the qualifying examination of the British Chartered Institute of Patent Agents in 1910. That is the body which deals with practitioners before the British Patent Office, and I came to this country in 1911, and I have practiced since that time in the taking out of foreign patents for American companies. I also have an office in London, in partnership with English partners who represent our firm in that country.

The CHAIRMAN. Of what country are you a native?

Mr. LANGNER. I am a native Britisher, naturalized United States citizen. I was adviser to the committee appointed by Mr. Woodrow Wilson to prepare the patent section of the Treaty of Versailles.

COMPARISON OF PROVISIONS OF FOREIGN AND U. S. PATENT SYSTEMS

Mr. DIENNER. Mr. Langner, will you please discuss the chief provisions of the patent systems of the most important industrial countries of Europe and compare the same with the provisions of the United States patent laws?

Mr. LANGNER. I will be glad to do that, but I would like to begin by explaining the provisions of the international convention which connects all these systems together. We have coming from the different countries an exchange of inventions, you might call them a two-directional stream, that is a stream of inventions coming from Europe, coming from the different countries of Europe, and then our inventions going over to those countries. That stream of inventions is regulated by what is known as the international convention. Forty-five countries of the world, including all of the leading industrial countries, are parties to that convention, and the theory behind that

convention is this: That no country shall give to its own nationals benefits which it does not give to the nationals of other countries. In other words, an American is treated in England the same way an Englishman is treated in England, and over here, we being parties to it, the nationals of other countries are treated under our patent laws the same way the United States nationals are.

When you get to these different countries, we have three types of patent systems.

The CHAIRMAN. Is the convention any broader than that?

Mr. LANGNER. There are certain specific provisions under this convention which, for example, allow a man who has filed an application in this country, 12 months priority to file in the other country, and he is protected during that 12 months' period from the consequence of publication which otherwise would invalidate his patent.

In other words the other features are matters of detail and of procedure; and every now and again they will agree on some new provision because this convention has been going on since 1883. They meet about every 6 years, I believe it is, and make changes in it. But the thing is a continuous conventional treaty.

The CHAIRMAN. How is the convention constituted?

Mr. LANGNER. It is constituted by—it is a treaty document that has to be ratified by the Senate, and at these meetings of the international convention we send over delegates. The last one was in London in 1934 and they formulate new suggestions and proposals. It covers not only patents but also trade-marks, designs, petty patents, and trade names.

The CHAIRMAN. What sanction is there for the suggestions or regulations that may be adopted by the convention?

Mr. LANGNER. They bring them back, each set of delegates brings them back to their own country and they must be ratified by the governments of the respective countries before the changes go into effect. We have three types of patent systems. I divide them in that way, based on the thing that most fundamentally distinguishes them, the fact as to whether they are examination patent systems, or registration patent systems. The leading industrial countries of the world, except France, have what they call an examination system that originated in the U. S. Patent Office and was copied by other countries rather slowly; and in fact it was only in 1904 that it was copied in England. It does not exist in France even at this date, although a project is before the French Parliament to introduce the examination system.

The second type of system is the registration system where you merely file a specification in the Patent Office, no examination is made, and the patent is granted without any examination at all.

The third type of patent system is the Russian patent system. That is the only system of its kind in which rewards are given to inventors. I think in view of some of the remarks made this morning about patent attorneys, you may be interested to know that practically all the patent attorneys in Russia were shot after this new law came into existence, and that is not a joke; that is absolutely true.

The CHAIRMAN. That was an effective way of dealing with that problem.

Mr. LANGNER. Yes, sir. Then we understand there is a system of rewards for inventors and I have been told, although I have never been able—

The CHAIRMAN. Distinguish that from the system that you have just described. It is not a reward?

Mr. LANGNER. I do not know how I could distinguish it except to say this, that we know in one case that has been reported to us where the inventor of certain inventions that were adopted in a factory was given an automobile and one of the most expensive apartments in the town, and the system of reward is that type of economic reward, as far as we are able to understand it. I have not found any case where a foreign corporation ever got a reward in that sense of the word.

Now, we have those three kinds of systems, and I would like to make this general remark, that I have noticed that the simpler the type of industrial civilization and the simpler the country, the simpler the patent system. The patent systems of these countries that follow what I call the registration type are extremely simple and they fit a more or less backward type of industrial civilization. The more complex the industry the more complex the patent system, and it is my opinion that as industry grows more complex the patent system must, if it is to serve that system, necessarily grow more complex. So for instance, we find that the English, German, and American patent systems are the most complex systems, perhaps the American the most complex of all, in its ramifications; and for instance, you can go to the other extreme and the Chinese patent system is about as simple as you can possibly have. That is, the need or necessity for a patent system in a country where the standards of living are very low, where wage scales are very low, the necessity for labor-saving machinery, for that kind of invention, is very small. Just about 5 years ago they adopted a patent law which only Chinese citizens could get patents under, and as far as we know very few patents have been issued.

The United States patent system differs from practically all the other patent systems of the world in two essential particulars. The right to obtain a patent is an absolute right for the inventor. That does not obtain in any other country. It is always surrounded by modifications which I will explain to you in a moment. The patent monopoly in the United States is an unconditional monopoly. In practically every other country in the world, in fact in every other country, it is a conditional monopoly, you are only granted the monopoly provided you do certain things, many of which are objectionable from the standpoint of the patentee and reduce the extent of his monopoly. Because of this, it is my opinion that we provide by this unconditional monopoly the greatest stimulus to invention that exists in any patent system. Indeed, I am constantly hearing from Europeans who come over here or people that I meet in Europe that that part of our patent system (they have criticisms for other parts of it) that grants this unconditional monopoly, in their opinion gives us the greatest stimulation to invention as compared with any other country.

Now, there are a number of provisions which we have in our laws as compared with foreign laws or provisions which they have which are objectionable which I would like to paint a picture of for you so that you can see how we differ.

In this country, as I have said before, the first inventor, under the Constitution, has the absolute right to the invention. Under the laws of most of the foreign countries it is the man who first either originates it and rushes to the Patent Office or even in Great Britain the first man who has found it in a foreign country and brings it into England that gets the patent. In other words, it is not the act of inventorship that is the condition for the grant of a patent, but the act of inventorship and being the first to bring it into the Patent Office. The result is that under the European system, when a man has invented something he is under a tremendous necessity to keep that thing secret until he files his patent application, because if it leaks out in any way, if it is published first, even if it comes from his own publication, even if it leaks into a newspaper, that publication prevents him from getting his patent.

The CHAIRMAN. Do I understand that in England inventorship really is not an essential qualification so far as the foreign patent is concerned?

Mr. LANGNER. For example, let me explain it this way. If I see an invention over here and I go over to England with it and file a patent application before the American does, or before the American applies under the international convention which gives us 12 months' priority, that is mine even though I didn't actually invent it; that is the idea. I will explain why that is later. It sounds like a very bad thing, but as a matter of fact it came from a very old provision in the law which I will explain as we go along.

But the fact is that instead of having the ample opportunity to work out an invention to develop it, to get together with other experts in order to see how the thing should be developed, you have to rush to the Patent Office. In fact, my early training in this idea of secrecy was so great that it took me many years to get over that idea that we must keep the thing absolutely secret before the patent application is filed.

In this country, as you know, we grant a period that isn't limited. We give a man the opportunity to work out his invention before he files the patent application. He can get the cooperation and collaboration of others, and his patent isn't invalidated if something is published or leaks out. He can even test it out by having samples on sale before he need go to the expense of filing his patent application. That doesn't exist at all abroad.

Another evil goes along with that, and that is that they file, very often, what I call half-baked patent applications; that is, applications that just are sketches, hardly enough to really be working exemplifications, and the result is that the patents that come out are often very ambiguous because they are mere sketches, and as compared with the thoroughly well worked-out patents applications that we file in this country they constitute a rather ambiguous document.

They have tried to overcome that defect in England by the practice of what they call filing a provisional application. That is to say when a man makes an invention he may just put in a brief description of the application. He is given 9 months to file the completed documents. That, however, leads to other troubles; disconformity between the provisional and the complete results in the patent being invalid, so you see it carries along with it these other disadvantages.

Now, you will realize one thing about this European system—that it doesn't involve interferences. There is no interference practice abroad because it is the man who first rushes to the patent office that gets the patent, and it practically never happens that both go in on the same day. If you had the invention second and you filed it on Monday and somebody else had it first and he filed on Tuesday, the man who filed on Monday is the one who gets the patent, so you have practically no interfering practice like we have in this country.

The CHAIRMAN. Suppose it were demonstrated the man who filed it on Monday really derived his knowledge from the man who filed on Tuesday?

Mr. LANGNER. In that case, if it were in fraud of the other man's rights he would have a remedy, but not otherwise. You would have to prove that fraud.

The CHAIRMAN. Then the purpose of the system is to grant the patent to the man who first makes application, provided he is not operating in fraud of another person.

Mr. LANGNER. Yes; the theory being that merely making the invention does not entitle you to a patent. It is making the invention and then disclosing it to the Government which entitles you to a patent, that makes you the first inventor. That theory in my opinion, while it eliminates the interference practice, has so many other disadvantages that I would much prefer the complexities of interference practice with such simplifications as you can bring into that practice than to go what I would call a step backward to this other theory.

The next place where your patent system is more liberal is in respect to the fact that the patent dates from the date of grant. In most other countries of the world the patent dates from the time of filing, and however long it may take you to prosecute the patent application is counted out of the term of the patent, so if for no fault of your own, as I have seen happen in Germany through people filing oppositions and obstructing the grant of your patent, you are kept in the Patent Office, as might happen there, 6 or 7 or 8 years; instead of your getting an 18-year patent all you get is the difference between the time that it was in the Patent Office and the unexpired term of the patent.

The Patent Office in the United States is considerably more liberal in the amount of time it allows a man to prosecute his patent application. In foreign countries we are very greatly rushed in getting a patent application through. In England we are allowed only 18 months, and if we don't get it through in 18 months the patent is abandoned. They give us 3 months' grace on top of that by paying a fine for each month's extension, but it results in very hurried last-minute rush work, and I have known cases where we have lost valuable claims owing to the fact that we didn't have enough time to get the application through.

Now, the Patent Office practice in this country is criticized for allowing an application to stay too long, but we have the criticism in the other direction in some of the foreign countries.

The practice in this country on reissue is very much more liberal. There is no such thing as a reissue practice in foreign countries. We do allow corrections of the patent after the patent has come out, but we don't allow the generous type of reissue that is allowed in this country.

In this country we have no annual taxes. In foreign countries the patent system is based on the idea that the Patent Office should be a revenue-producing office, and every patent has to pay an annual tax. This tax grows progressively higher as the patent grows older. For example, in Great Britain the cost of the British patent in Government fees is over \$600; that is, the man has to pay to the Government for a 16-year patent over \$600. In Germany he has to pay over \$2,000. That is, I am now talking about the man over here; that is the rate of exchange; I wouldn't want to say what a German mark was in Germany, but at any rate in the international market it is costing him \$2,000.

This tax system often results in a poor inventor who hasn't very much money to pay for these taxes dropping his patent, when if he had been able to wait 2 or 3 years he might have had the opportunity of exploiting it.

It is said by people who are in favor of this tax idea that it has the result of causing the obsolete or paper patents to drop out as people do not bother to pay the taxes on them. On the other hand, it also causes a certain number of good and valuable patents to drop out.

The CHAIRMAN. But when the patent drops out, is it thereby dedicated to the public?

Mr. LANGNER. It then becomes dedicated and it is not possible to revive it unless the failure to pay the fee was due to accident or inadvertence. As a general rule they do not regard poverty as a good reason for reviving the patent.

Mr. DIENNER. It is no accident.

Mr. LANGNER. No.

The CHAIRMAN. In other words, it means the foreign system requires the inventor as a consideration for keeping his patent alive, to make a certain payment annually to the State.

Mr. LANGNER. Yes; in addition to the other taxes that he has to pay if he is earning an income. That is the reason that I said just now that it is a conditional monopoly, that is conditional on your paying that annual tax.

Representative SUMNERS. May I ask a question? You speak of the difference in the length of time permitted in England and the time permitted here in which to prosecute the conclusion of your application for patent. Is the Patent Office in England, or whatever country you may have had in mind, so organized that they are always prepared to proceed when the applicant is ready to present his application?

Mr. LANGNER. In replying to that I would say that they are not always. It depends on the state of the work in the particular division of the Patent Office. Some are more behind than others and I think that it has to do with the fact that shorter terms are allowed; that is, when the examiner issues an objection he gives an Englishman only 2 months in which to reply and a foreigner gets 3 months. So if you don't reply in the 2 months or the 3 months, you have to pay a fine for a month's extension, and then if you don't reply then, you pay another fine, and after a while, after that has happened once or twice, they give a final term and then if you don't reply you are rejected.

Representative SUMNERS. What I am trying to get at for the specific value of the thing is whether or not any delays which may occur in our procedure beyond those which you observe in the foreign

countries are due to the lack of proper equipment governmentally, in order to expedite the determination, or is it due to, perhaps, too much leeway which is given by us to the applicant?

Mr. LANGNER. Well, I think it is largely due to the leeway of 6 months which is given in this country, and I don't think that it is due to comparatively any worse workings on the part of the United States Patent Office as compared with the foreign patent offices.

Representative SUMNERS. This period of 6 months which we give, which results in a longer time between the application and the conclusion of the effort to get the patent: Could that in safety, or rather in justice to the applicant, be reduced, in your judgment, or would you like to express a judgment about it?

Mr. LANGNER. Well, I feel that the system that exists abroad is a better system. You start off with a shorter period and you give the Commissioner the right to prolong it if there is a good reason for it. In other words, you don't simply say to him, "It is 6 months." You say 2 months or 3 months, as the case may be, with the right to extensions if you can show good reason for the extensions.

Representative SUMNERS. One other question while you are interrupted, if I may ask it. You say that there is a tax levied against the patent, that that tax is progressive as the age of the patent extends. Can the patentee escape the tax by abandoning the patent? Is there any arrangement under which he can declare an abandonment and escape the tax?

Mr. LANGNER. He has a perfect escape, which consists in not paying the tax, and then the patent is dropped.

Representative SUMNERS. Is the tax levied against the patent or against the person? We in this country do not have the possibility of escaping taxes so easily. We could not in this country just not pay the tax. What I am trying to get at is, is the tax levied against the patent?

Mr. LANGNER. I would say it was levied against the patent, because the patent expires automatically if you don't pay the tax.

Representative SUMNERS. That is the question I asked you. Thank you, sir.

The CHAIRMAN. May I ask whether the patent applicant abroad must bear the burden of delays in the Patent Office?

Mr. LANGNER. No.

The CHAIRMAN. So the term doesn't begin to run against the applicant until he receives notice of action by the Patent Office.

Mr. LANGNER. I think I have misunderstood your question. Of course if the Patent Office waited for 6 months, or 10 months, before it started action, that is counted off the term of the patent.

The CHAIRMAN. So the burden is on the patent applicant for any delay that may be—

Mr. LANGNER (interposing). Made by the Patent Office.

The CHAIRMAN. Made by the Patent Office.

Mr. LANGNER. And it is subtracted from the term of the patent all the time, which is a bad feature compared with the practice in this country.

Representative SUMNERS. May I ask one question. Does the fact that delay operates against the time of the applicant tend materially to stimulate the applicant in speeding up the conclusion of his application?

Mr. LANGNER. I don't think that that contributes nearly as much as the shorter terms that the patent office provides and the fact that you are apt to pay a fine if you don't file within the period of the term. I think that that has more to do with it. You will realize that under our opposition practice we have a practice that also delays applications going out of the patent office, just as you have with your interference practice.

Mr. DIENNER. You are on the wrong side of the fence—you mean in Europe.

Mr. LANGNER. I beg your pardon, I meant in the European practice, which is the practice that I practice and so I call it "our." The opposition proceedings are proceedings which exist in practically all of the countries which follow the first type, that is the examination system. They exist in Great Britain, Germany, Holland, Denmark, Czechoslovakia, practically all the industrial countries. When the patent application has been allowed it is laid open for public inspection, that is to say the documents are either printed or available in the Patent Office, and a period of 3 months is allowed during which anyone who wants to make an objection against the grant of that patent may do so, and that results in practically giving everyone in the country who has an interest to do so, an opportunity to attack that patent before it ever comes out; that is, they can come in there and show prior patents, they can attack its validity, they can bring in, as they very often do, alleged prior uses, and they can subject the patentee to practically what amounts to a litigation proceeding.

The CHAIRMAN. Isn't that interference practice?

Mr. LANGNER. No, sir; for this reason. It differs from interference practice in this way. The interference practice here is a contest between two parties as to who really owns the invention. That is what an interference practice is.

This practice, this opposition practice, has nothing to do, generally has nothing to do—there might be a case which I will explain in a minute—but generally speaking has nothing to do with the question of ownership of the invention. It simply has to do with the fact that A has filed a patent application; it is laid open for public inspection, and B thinks he ought not to have it, and so B comes along and says he ought not to have that because it is old; I can show you some patents that are like it. In other words, it gives them an opportunity to attack the decision of the Patent Office in granting the patent, and that—

The CHAIRMAN. Now, A is about to get his patent. B undertakes opposition proceedings on the ground that he, B, has a prior patent which covers the same art?

Mr. LANGNER. Not necessarily; it could be that, or it could be that the thing was in some workshop or that it was being used somewhere, or that it was illustrated in a magazine. It does not have to be necessarily his, or, as I should say, in 9 cases out of 10—

The CHAIRMAN. The distinction that you make is—I am stating this intending it as a question, though it is not in that form—is that the opposition practice appears rather on behalf of the public than upon behalf of another inventor. Is that right?

Mr. LANGNER. No, sir; I do not think that is correct, either. It is practically the attack is made in the same way that an attack is made in an infringement suit. You attack the patent in every way

that you can possibly knock it out before it ever comes out of the Patent Office.

The CHAIRMAN. Then in other words this opposition practice probably arises when a person wants to use the device without recognizing the obligations which come from that?

Mr. LANGNER. Yes; and in 9 cases out of 10 they will take, in certain countries, 3 or 4 devices, none of which are really the same thing, and say that there is no invention in combining those 3 or 4 things together and getting this device.

Representative SUMNERS. Now when you have a practice of that sort where any person, where all persons are given at least constructive notice, and any person may appear in opposition, alleging, setting up any ground, any recognized ground for an issue to the patent, does that at all affect the right to urge those same objections in any suit in a court after the patent has been issued, or may there be suits in courts where that procedure obtains after the patent has been issued?

Mr. LANGNER. Yes, sir; the mere fact that the patent is granted does not estop the opponent from later on urging those same patents before the courts.

Representative SUMNERS. Well, is there resort to that tribunal—if we may so designate it, and I believe we may, from your description—because of the fact that it is less formal and more economical and more easy to get at than to wait and go into ordinary court?

Mr. LANGNER. Yes; it results in certain abuses in this sense; it is an inexpensive way of attacking a man's patent before he actually has it, and it results, for instance, in some instances where a very large industry which makes a practice of opposing every patent that comes into that industry, and putting onto the applicant for the patent at a time when he is still in a state of financial difficulties that go with promoting an invention, the burden of fighting against them for this patent, at a time when he is really not ready to do so.

Representative SUMNERS. Now suppose there is an adverse decision to the applicant. Would his remedy be to go into court and do what we would call in this country attempt to mandamus the agency of the Patent Office and compel the issuance of a patent?

Mr. LANGNER. No, sir; there is not that right in these foreign countries. I would like to explain that part of the system to you.

Representative SUMNERS. Am I interrupting your order of procedure?

Mr. LANGNER. If I could have just a little time to explain it to you I think I could give you the picture. Take for instance the German patent system, from the decision of the opposition department the appeal is taken to what they call the "Senate" of the Patent Office, so that both the opposition itself and the appeal is heard right inside the Patent Office. There is no opportunity of going out to the court. In England—

Representative SUMNERS. Would you indicate before you go further the constituent elements of the senate so we can have the picture?

Mr. LANGNER. It is made up of three—the patent office Senate is made up of three men who are the examiners of that particular division of the Patent Office.

The CHAIRMAN. Offhand, I should say that was probably a very good system, Judge.

Representative SUMNERS. I don't like the name, but it is all right.

Mr. LANGNER. In England there is an appeal from the patent office to a court. Now, the opposition system, however, is not as simple as it sounds. One of the practices that happens, and that I have run across several times in my experience, is this. You will get a letter from a competitor saying that they are going to file an opposition unless you will give them a license on practically a nominal amount; or I have known at least 12 cases in my practice where they say a free license. In other words, "unless you give us a free license under this patent we are going to oppose."

They will come and show you what they are going to use. They say, "We are going to put in this patent and that patent and the other patent, so you better give us a free license or else we will make trouble for you."

Representative SUMNERS. Is that penalized in any sort of way in the countries where that practice obtains?

Mr. LANGNER. No; it is not.

Representative SUMNERS. It is legitimate if you can make him do it?

Mr. LANGNER. Yes; it is done as a common practice in some of these countries.

Representative SUMNERS. That is very interesting.

Mr. LANGNER. To my way of thinking, I regard the opposition practice as one of those things that superficially seems like a good thing, but actually when you go into it it is not a good thing at all. It puts the man without resources in a position where he can be attacked by the man who has the resources to do it.

The CHAIRMAN. The interference process, in other words, is infinitely superior to it from the point of view of the inventor, even with all its defects.

Mr. LANGNER. Yes; on account of the thing I told you about earlier; that is, the fact that he has this time to go ahead.

The CHAIRMAN. Because if the inventor, under the interference process, eventually gets his patent, he has protection.

Mr. LANGNER. He has that protection; he doesn't have to defend his patent at a time when he is not really ready to do so.

Representative SUMNERS. Is this proceeding before the Senate a public proceeding, a proceeding of record?

The CHAIRMAN. If you don't like that word, don't use it.

Mr. LANGNER. Call it the appeal department.

Representative SUMNERS. I don't mean to be facetious. That is better. What I am trying to find out, is that proceeding a proceeding of record? Is there a record made of the proceeding before the Senate, and is there any appeal from that record to any other agency of the Government, or do you have to start de novo if anything else is done with reference to a question of the patent?

Mr. LANGNER. The files of the Patent Office in every country of the world outside of the United States are not open to the public and under the German practice you are only allowed to see those files if you are involved in litigation under the patent, and therefore those are not open to the general public.

After we get through the opposition period, a patent is granted. Now, under the European system, and in some countries for limited

periods but in other countries throughout the entire life of the patent, anyone can bring what they call a nullity suit, or a revocation suit. In Germany that is limited to 5 years after the grant of the patent. In England there is no limitation. You can at any time bring an action to revoke that patent, which again means that the patentee may be put to the expense of defending his patent without there being, perhaps, any real reason for it, and again perhaps under threat.

The CHAIRMAN. If a patent should be revoked, is there any retro-active effect upon the patentee?

Mr. LANGNER. In what sense?

The CHAIRMAN. Well, as for royalties that he may have received from some licensee.

Mr. LANGNER. No, not if the patent was in force at that time.

In addition to that, patents in most of these countries are subject to what they call the compulsory license provisions. Those compulsory license provisions have to do largely with questions relating—that is, they arose in our jurisprudence owing to the fact that patents were used in many of these countries to prevent the development of an industry by importing the goods from abroad.

I would like to explain that to you in further detail, but I have prepared myself to go into that quite fully with you, to explain those compulsory license provisions, but before I do that I would like to run through the general explanation of the foreign systems, and then come back to this compulsory license.

The CHAIRMAN. That will be quite satisfactory.

Mr. LANGNER. So that you can go into it in further detail.

Now, when you add up these different things which exist and which harass an inventor in the foreign countries, you will see what I mean when I say that we give the finest patent, that is we give an unconditional monopoly as compared with their conditional monopoly, and I feel that the result of that is reflected in the tremendous interest that exists in the United States as regards invention as compared with the interest that exists in other countries. I have made a note here—I mean I can speak from my own experience, coming from the other side with a certain amount of knowledge of inventions—that I found the entire attitude over here a great deal more stimulating, there was a great deal more interest, more excitement about new inventions, and it is interesting as a matter of historical fact that many other foreigners have come over to this country and under the stimulus of the patent system have become some of our leading inventors. I have made a note of some of those men. One of them was Pupin, whose name has been mentioned here, who came over here from Serbia. Another man was Alexander Graham Bell, who came from Canada, I believe. Another man was Steinmetz, who as you know was one of the great inventors—they called him the wizard of Schenectady, the man who built up through his inventions the great General Electric Co. In my own experience I have run across a number of European inventors who have come over here, and I believe under the opportunities and stimulations in our law have made extraordinarily interesting inventions. You have all noticed this great improvement in refrigeration in trains, that is the air conditioning systems. There was a Belgian who came over here, Dr. Henney, a number of years ago, who invented the nonpoisonous

refrigerant—he did that in Columbus, Ohio—which is used in all these trains now. Before his invention, practically any refrigerant was poisonous, so that if there were a leakage in the carriage with the windows all closed, I was going to say you would wake up in the morning dead. But under the development of that nonpoisonous refrigerant, which is called Freon, you have the possibility of bringing air conditioning into the home, into the theaters, into closed places where it was never possible before. That was the invention of a Belgian.

The CHAIRMAN. In other words, you are saying that our system has attracted to this country foreign inventors and we thereby get the benefit of their brains because of our system.

Mr. LANGNER. Yes, sir. I think that throughout the world the word “American” is almost associated with the word “invention.”

Representative SUMNERS. Somewhere are you going to discuss the ease or practical ease with which foreigners have access to results of the inventive genius that have assembled themselves in America?

Mr. LANGNER. I will talk about that in a minute when I get to this particular part about the use of our patents in export trade. I am going to cover that in a moment.

We have here, as I say, an unconditional monopoly; we have the differentiation between our system and all others. There are, on the other hand, certain features in the foreign practice for which I would like to say a good word, as you are considering the whole of the patent system. First of all, among the good features of our foreign patent practice I would like to refer to the claims that we use. I think a great deal of improvement could be made in the American form of claim. The European form of claim which we use in our European specifications is much simpler, it is much easier to understand, and I believe that a great deal of litigation which goes on in this country today is due to a rather complicated method of drafting claims which could be improved by using the very simple method that we draft claims in England, especially in England. We very often have turned over to us something like 30 or 40 American claims, perhaps, and when we get through drafting the foreign claims, there will be only 5 to 10, and they will cover in considerably simpler language the same invention that is covered by this large number of American claims.

I must explain to you that the reason why claims are drafted in that way in this country is due to literally thousands of decisions of the courts on claims, and therefore, when I say that it would be better to have our form of claim, I don't know how you are ever going to get it—

The CHAIRMAN (interposing). When you use the word “our”—

Mr. LANGNER (interposing). I mean the British form, remembering that I am always practicing before those patent offices and not before the American.

The CHAIRMAN. I wanted to have it in the record.

Mr. LANGNER. Yes. The British form of claim differentiates from the American claim in that a man is allowed to use entirely his own language in drafting the claim; he is not called upon to claim a combination of elements, and this simplification makes it much easier for the patent office to examine the patent application, it saves time in the prosecution of the patent application, and it also reduces the

amount of litigation because the claims are not nearly so ambiguous.

The next point where I think the foreign practice is better than the United States practice is in respect of the fact that we have two different classifications of inventions. We have the patent and petty patent, or, as it is called in England, that is the corresponding method of protection in England is called the design; it isn't called the design patent, it is called the registered design. In this country you have the patent and the design patent, but the design patent in this country covers an ornamental design, whereas the design registration in England can cover a function such as the shape of a tool, something that isn't ornamental at all, and in Germany the petty patent and in many other countries where they have petty patents, any little device which isn't important enough to warrant the granting of a regular patent can be protected under the petty patent.

The CHAIRMAN. What is the difference in the term?

Mr. LANGNER. The term is usually much less and the scope or the interpretation placed by the courts on these patents is very much more limited. Actually in the British registered design you have to put the two side by side and come to a conclusion as to whether one has been copied from the other. I believe the fact that we have no special provisions for such protection in this country throws a load on the patent office to have to take care of inventions of a minor character as well as of a major character; the same system has to take care of minor inventions as well as major inventions. That load might be reduced by introducing something in the nature of a registered design system. In fact, many attempts have been made, I myself have assisted in many attempts that have been made to provide a better design system in this country, and those attempts have always failed. We have never been able to succeed in getting them through Congress, largely due to the opposition of the drygoods stores who complain that they never would know whether they were infringing one of these petty patents or not, and they were always very convincing in their argument. But the fact remains that I believe the patent system suffers from that.

The last part of what I had to say, before I came to compulsory licenses, was the question of what our inventions accomplish for us in the export trade. Naturally as I take out these patents in these foreign countries I inquire into the reasons for the protection they afford. They are taken out in these foreign countries for perhaps two main reasons. One is that where we are doing business abroad, we are sending out business machines, typewriters, calculating machines, cash registers, and so forth, automobiles, and we want to protect our article so that the German manufacturer or the English manufacturer isn't able to copy it immediately and go into competition with us. In other words, it is a great selling point for our goods to have a protected inventive feature, and I think we have kept ahead of the whole world in the export markets through our patent system and through the fact that our American machinery is the best of its kind, and the most ingenious and up-to-date.

Now you have to remember that we are competing against much lower standards, that is goods made under conditions of much lower standards of living, and very often lower-priced goods. Nevertheless, our goods sell in those markets and I think sell very largely, our spe-

cialty goods, on the basis of the inventive features which they carry with them.

Another interesting aspect of our inventions abroad which I have noticed is that one reason why our inventions have helped our export markets is because they embody with them what I call democratic ideas. When I first came over to this country I met Mr. Kettering who has been before you, and I took out the patent in foreign countries on the Delco self-starter. This will illustrate what I mean about democratic ideas in invention. Mr. Hunt, one of the engineers, and myself went over to England and we tried to introduce the Delco starter among British and other companies. Mr. Hunt went to one of the big English companies and said, "We have this electric starter for automobiles and we would like to have you put it on your car."

So the man said, "You know, it will cost 20 or 30 pounds more. Why should we put it on the car?"

Mr. Hunt said, "Well, if you have this starter on the car, when the car stops the owner won't have to get out and crank the engine, he can put his foot on the pedal and start it."

The man said, "You know, the people who use our cars have their own chauffeurs, they wouldn't dream of driving a car themselves, you see."

"Well," Hunt said, "if the chauffeur gets out and cranks the car it might backfire and break his arm."

So this man said, "I don't know that that would be very much of an argument. You know our chauffeurs are all insured."

Hunt was baffled but not beaten, and so he said, "I'll tell you, you will sell a lot more cars if they have this starter on, because with this starter on the car women can drive."

The man said, "Women drive? God forbid."

The idea didn't exist at that time that an automobile might be something that was owned by a farmer or a workingman or used by a woman, and it wasn't until our cheap American cars got onto these foreign markets that they began to competitively put electric starters on automobiles.

What I have said in regard to that exists in a way that very few people have realized. Here we have a country where we have raised the standard of living of the masses of the people. A farmer can afford to help his wife out by giving her a little washing machine or a vacuum cleaner, or some little electrical household device or some mechanism to make her work easier. Mr. Kettering invented the Delco light system, a little farm lighting plant. Now, when we took out the patents on that device, that little lighting plant, and when we came to take out the English patents, we had cited against us the only art that the British industry knew about, and that was lighting plants for lighting country houses, big country estates, where they had to generate electricity in order to take care of some duke's estate up in the highlands, his hunting lodge or something of that kind.

Now, those inventions of ours brought our goods into markets like Australia and South Africa where there were farmers, like our farmers, who had the condition of long distances; and the English cars and the English goods which were made for the gentlemen of England, so to speak, couldn't compete with us in those countries and we were years ahead of them.

So I feel that it is extremely important for our export trade that we keep up our patent system in the way we have; as much as we possibly can, keep this stimulus.

Now, we are coming into a new era of competition in foreign countries. We are going to have to compete, and are competing now, against the barter system. We are also going to have to compete against what I call the government-subsidized, totalitarian manufacturer. We are already reading in the papers about a Volkswagen which is going to be sold for 900 marks. We are hearing about a Volksradio which is being sold for 14 marks. The governments of those countries that feel that they should subsidize artificial rubber substitutes, and so forth—we are going sooner or later to meet that competition in foreign trade.

I feel very strongly that the one thing that we have always had and that we have always beaten the Europeans at is invention. We have always been able to put out something that is 3 or 4 or 5 years ahead of what they get, and when they come along they come along that much later.

The CHAIRMAN. What is the effect upon the International Convention of the totalitarian plan of subsidization? Or to simplify the question, have you anything to say about whether or not in Germany, Italy, or Russia any effort has been made by the government to commandeer American patents within the boundaries of any one of these countries?

Mr. LANGNER. No, sir; there has been no effort made, and in fact we have in a number of instances within the last 2 or 3 years, Americans have obtained patents against the opposition of large German industrial companies. They get together afterward and make a license on them, perhaps, but there has not been anything of that nature in the patent relation. You will realize that every country is vulnerable in that respect.

The CHAIRMAN. But if this subsidization plan is pursued an inevitable consequence would be the suppression of patent rights to foreigners, would it not?

Mr. LANGNER. I do not know that it would necessarily be so.

The CHAIRMAN. Unless that was protected by treaty?

Mr. LANGNER. They are now, you see, and of course you must realize that, as I am going to explain to you shortly; every industrial country is in a bad position if it treats the nationals of another country badly, and therefore there is a great balance against such a possibility. In fact, as I am going to explain to you now, perhaps I am ready to come to that point, in connection—

The CHAIRMAN. Before you get to that may I ask whether or not there—there are two questions running through my mind; first, what your experience is with the Canadian law; and secondly, whether the patent systems of European countries have been used or are being used by industrialists in those countries for the purpose of cartilization. That is to say, control of industries for monopolistic purposes.

Mr. LANGNER. Well, I will answer as far as the Canadian system is concerned it is half-way between the European and the American. It is very much like the American patent system as a whole. On the question of cartilization, in Germany, for example, and some other countries there is undoubtedly a tendency to concentrate industry

into large groups. I do not believe the patent system has contributed to that nearly as much as I believe it has been encouraged by the governments. In other words, I do not believe that is a phenomena of the patent system, although the patent system is undoubtedly involved in it because there is a good deal of cross licensing in that country; that is the division of patent rights and so forth between different companies.

But I would say that it was a deliberate governmental policy.

The CHAIRMAN. In other words, the Government policy, rather than the utilization of patent law, has been the cause of the growth of the cartel system.

Mr. LANGNER. I would say so.

The CHAIRMAN. Thank you.

Mr. LANGNER. Now, when you come to the compulsory license question, in which I know you are very much interested, I am going to be the second person to explain the statute of monopolies to you. I think you got a little wrong information yesterday on that subject. I don't think Dr. Jewett quite understood what was meant by that statute, but in order for you to understand the compulsory license I think you should go back to that part in our history, and I will give you the picture.

The CHAIRMAN. Our history is—which history is that?

Mr. LANGNER. The history of all patents—American, English, and so on. It all stemmed from the early English patent system.

The statute of monopolies prohibited monopoly of any kind except in respect of inventions and manner of manufacture. It is generally a popular misconception that the purpose of that statute was to encourage psychological invention. It was not the purpose of that statute at all to encourage psychological invention, which was something that was hardly known at that time. It was the purpose to encourage the bringing in of new industries to England from other countries, and by invention—the use of the word invention at that time was, “invent” had the meaning of “bringing in.” The period of the patent was taken from two periods of apprenticeship, each period being 7 years, so that the idea was that they would attract the Flemish weavers or they would attract printers from Germany or other industrialists to come over to England, which was at that time industrially speaking just a beginning country, and bring their industries over there and teach two sets of English apprentices the industry so that the industry could go along.

That conception continued for around 100 years, and gradually became replaced as mechanical invention began to grow with the idea of psychological invention, which gradually developed into the filing of a patent specification and the gradual dropping out of the British practice of this idea of manufacture going along with the grant of a patent.

I may tell you that as a young man I was very curious to see what patent No. 1 was in the English Patent Office library, and patent No. 2, so I went over there and took a look at them. Patent No. 1 was the manufacture of playing cards; patent No. 2 was for the printing of a map of London by a French designer who had printed a map of Paris that looked just like it, so when you hear that you realize that that statute of monopolies was a little different from what is often thought.

Now, this idea of manufacture went out of the British patent system completely, until the year 1883. Then it was brought back again for an entirely different reason.

At that time, or perhaps a few years before, the German chemical industry began to develop and this chemical industry—well, an Englishman had invented the original coal-tar dyes, but the German chemical industry had got hold of it and with their methodical methods of scientific research and so on had begun to spread out and become a world dominating chemical industry, and this thing became such a peril to the British chemical industry that a great deal of agitation broke out on the subject.

To give you the atmosphere under which compulsory licenses were introduced and the working of compulsory licenses, I would like to read to you something that was written by Joseph Chamberlain, father of the present Neville Chamberlain. He did not believe in appeasement, by the way. He said:

It has been pointed out especially in an interesting memorial presented on behalf of the chemical industry that under the present law it would have been possible, for instance, for the German inventor of the hot blast furnace, if he had chosen to refuse a license in England, to have destroyed almost the whole iron industry of this country and to carry the business bodily over to Germany. Although that did not happen in the case of the hot blast industry, it had actually happened in the manufacture of artificial colors connected with the coal products, and the whole of that had gone to Germany because the patentees would not grant a license in this country.

In other words, the first British compulsory license law was directed against the practice of the Germans in taking out patents on the chemical industry in England and using those patents to kill the British chemical industry.

The CHAIRMAN. When did Joseph Chamberlain make that statement?

Mr. LANGNER. I believe in 1882 or 1883. I can perhaps find the exact date.

The CHAIRMAN. That is an approximation.

Mr. LANGNER. Yes. It was in introducing the act of 1883.

The CHAIRMAN. In other words, Joseph Chamberlain sponsored the compulsory licensing bill in the British Parliament.

Mr. LANGNER. In the British Parliament; yes.

The procedure under those laws, before the Board of Trade and later before the Privy Council, was pretty much of a wash-out. It was very expensive. It cost as much as \$20,000 to go through with it, and the same condition continued from 1883, in spite of this compulsory licensing law, until 1907.

The CHAIRMAN. If I understand you correctly, then, Chamberlain sponsored the compulsory licensing bill in the belief that without it British industry might be exported to Germany or elsewhere, and it was to prevent the exportation of British patents and industries developing under those patents that he sponsored this measure?

Mr. LANGNER. Yes, sir.

The CHAIRMAN. Was he justified, in your opinion, in that activity at that time?

Mr. LANGNER. I think perhaps it would be more correct to state that already the German industry had established that condition that the British industry was suffering under, and this law did not help to solve the problem because the procedure was far too expensive,

and in 1907 they tried to cure the procedure by a new law, and that law was introduced by Mr. Lloyd George, and I will tell you what he said in introducing that new law.

He said:

The object of the patent laws is to reward ingenuity and by so doing to encourage invention and to promote British industry. Unfortunately, however, they have been used in many respects to discourage the British inventor and to destroy many British industries. What is happening at the present moment? Out of 14,700 patents issued last year, 6,500 are foreign. I do not object to that, but a good many of these patents have been taken out not for the purpose of working the patents in this country, but for the purpose of preventing their being worked. That I consider to be an abuse of a privilege conceded by British laws.

The British inventor who takes out a patent is very often a poor man who has been able to get his patent financed up to a certain point. After he has started and set up works and purchased machinery there comes a powerful foreign syndicate which has found there is something in his patent which they imagine is covered by an invention they have already patented, for these patents are very often in exceedingly vague terms. This syndicate then brings to bear the whole machinery of their powerful organization to crush the inventor.

He goes on to say:

Big foreign syndicates have one very effective way of destroying British industry. They first of all apply for patents on a very considerable scale. They suggest every possible combination, for instance, in chemicals, which human ingenuity can possibly think of. These combinations the syndicates have not tried themselves. They are not in operation, say, in Germany or elsewhere, but the syndicates put them in their patents in obscure and vague terms so as to cover any possible invention that may be discovered afterward in this country.

This again was aimed at the German chemical industry.

Some of you gentlemen may remember that at the same time that agitation was going on in England a great agitation was going on in this country against the German chemical industry for the very same reasons. That resulted in the negotiation of a treaty between this country and Germany which treaty is still in existence. It was renewed after the war. And the purpose of that treaty was to endeavor to meet this situation which, in England, was met by the passage of these working laws.

Under that treaty an American does not have to work in Germany.

The CHAIRMAN. May I interrupt to ask what the principal features of the Lloyd George Act were?

Mr. LANGNER. As compared to the earlier one? I will be glad to do that. The Lloyd George Act was much more drastic. It provided not for compulsory licenses under these conditions, but for revocation of a patent if the invention was being mainly manufactured abroad, and again it came before the courts of England for a number of years. A number of patents—not very many—were revoked, and gradually there grew up in the courts certain practices which made it almost impossible to get a patent revoked. One of those practices was that the burden of proof was on the applicant for revocation to prove how much the invention was being manufactured abroad, and it was awfully difficult for him to show that it was being mainly manufactured abroad. It was very hard to establish that it was mainly manufactured abroad. Again the remedy of revocation was very bad, because while these English manufacturers wanted to have the field clear, once the patent was revoked they didn't have a patent to work under, so that it was difficult for them to invest money in that process when all their competitors could also invest money in the process and come into competition with them, so that for that reason again

the British patent laws were revised in 1919—1883, 1904, 1907, and 1919—and a new compulsory license law was provided which again attempted to meet this problem, but to do so by putting in as an alternative to revocation the grant of compulsory licenses. So that only in the case where compulsory license was not a sufficient remedy, could the patent be revoked and that law is in effect right at the present time.

The CHAIRMAN. Do you think that is an effective law?

Mr. LANGNER. Well, that law has—I can give you some figures about that law. The purpose of the law, as I have explained before is to prevent—largely, not entirely, but the main idea behind the law is to prevent foreigners from coming into England and supplying the demand from abroad while using the English patent to prevent the development of British industry. Now since 1919 to date, which is a period of around 19 years, only nine cases have come up for decision. Of these nine cases six were applications of a British company for licenses against a foreign or British company in which the grounds for a license were generally that the invention was being manufactured abroad, and not in Great Britain. The other three cases were where British companies applied for compulsory licenses under patents owned by other British companies. Of the six cases where a British company asked for a license under a patent, where the invention was manufactured abroad, in five cases nonexclusive licenses were granted and one case was refused. In the three cases where British companies applied for licenses under patents granted to other British companies, in all three cases the licenses were refused.

That is, that up to date this law has only been effective in England in the case where the patent was being used to benefit a foreign industry at the expense of the British industry.

Representative SUMNERS. Have you discussed the basis of compensation, how compensation is arrived at in a case of compulsory issuance of license? You have to pay something for it, don't you?

Mr. LANGNER. Yes; the question is argued before the British Controller, corresponding to the Commissioner of Patents, and he finally comes to a conclusion. I have not gone through the decisions.

Representative SUMNERS. Any statutory provision?

Mr. LANGNER. No; it is within the discretion of the Controller with an appeal to the court to fix the amount of the license.

Representative SUMNERS. But in the determination of the question I assume you have expert testimony, or whatever testimony would seem to bear upon the question, as to what ought to be compensation, but there are no statutory standards or standards fixed by any agency of the Government?

Mr. LANGNER. No standards of that kind.

Representative SUMNERS. A moment ago or several times you have spoken of the invention being manufactured abroad. Would that apply to machinery with which the commodity is produced, or through the commodity itself?

Mr. LANGNER. If the commodity itself is patented it would refer to the machine and if both of them, as sometimes happens—

Representative SUMNERS. To make it clear for the record, suppose it is a process for manufacturing cotton goods, would the British law become effective, become operative, if the machinery only was manu-

factured abroad—I would like to change my question. In a proceeding where this provision of the law is brought into operation, would the question as to where the cotton cloth is manufactured be affected by the place where the machinery is manufactured?

Mr. LANGNER. Well, sir, it would depend on what the patent itself covered.

Representative SUMNERS. Assuming it covered machinery.

Mr. LANGNER. If it covered the machine then you should manufacture that machinery in England. If you manufactured the machinery in America and supplied the English demand only by importation, a condition arises under which an English manufacturer could ask for a license.

Representative SUMNERS. If you manufactured the machinery in America and sold the machine in England for instance as cheaply as you sold it in America, you still would come under the inhibitions or regulations of that law?

Mr. LANGNER. Well, if it constituted what they call an abuse of the monopoly rights. You would have the right to say in your defense that perhaps the demand was so small that the machine would cost a great deal more if it were manufactured in England. You would have several rights of defense because you are allowed to give reasons why you have not manufactured, but generally speaking you are in a difficult position if you have used your English patent to supply the market entirely with machinery from America.

Representative SUMNERS. I do not like to press it, but I would like to be very clear on this point. Assuming that in one particular country they did not manufacture the cloth, to make the illustration.

Mr. LANGNER. They did not manufacture?

Representative SUMNERS. Assuming that in a particular country they did not manufacture cloth, did not manufacture cotton cloth at all, but did manufacture the machinery with which you manufactured the cloth, and that machine was sold generally in the markets of the world at an equal price, freight being considered, everywhere. Would that state of facts justify possibly a successful procedure under the English law?

Mr. LANGNER. Where is the machine manufactured?

Representative SUMNERS. Assuming in any country, not in England, but in any other country and in that country they manufacture the machine; they manufacture no cloth at all; they only manufacture the machine with which the cloth is manufactured, and that machine may be bought freely in England at the same price it may be bought anywhere else in the world, freight being considered.

Mr. LANGNER. And it is a patented machine?

Representative SUMNERS. And it is a patented machine and the machine of course is patented and made in order to produce, primarily, cotton cloth.

Mr. LANGNER. Well, I would say that if that sale was made and it could be established it was hurting the British machine industry of that type; that is, you were putting the British manufacturers out of business with that foreign-made machine, that this law, unless there were extenuating factors, this law would apply and a British manufacturer might get a compulsory license.

The CHAIRMAN. In other words a manufacturer of machines in Great Britain would be authorized under this law to file a proceeding

against a foreign holder of a British patent to make the machine to require a compulsory license?

Mr. LANGNER. If the manufacturer was supplying the English demand only by importation.

The CHAIRMAN. That is the point; that is the question.

Mr. LANGNER. And there was no factor such as extreme expense which sometimes comes up, where there are only two or three——

The CHAIRMAN. So that if the foreign holder of a British patent to make such a machine as Congressman Sumners has described was granted an exclusive license to warrant a British manufacturer to make that machine, a competitor of that licensee would be authorized under this act to bring his proceeding to compel the issuance of a license to him also?

Mr. LANGNER. I do not understand that, sir. Would you mind repeating that? I do not think that is the case.

The CHAIRMAN. I will admit it was probably a rather involved statement. I assume that a foreign manufacturer of machines has secured a patent in Great Britain for his device and has granted an exclusive license to a British machine manufacturer, then would not a British competitor of that licensee be authorized under this act to bring his proceeding against the foreign patentee for a compulsory license?

Mr. LANGNER. No; absolutely not.

The CHAIRMAN. He would not?

Mr. LANGNER. Not if that British licensee is manufacturing in Great Britain.

The CHAIRMAN. That is exactly what I mean. So that the British compulsory licensing which you describe does not operate where one license is granted within Great Britain.

Mr. LANGNER. Providing that licensee is not abusing the monopoly rights, which means that he is supplying the demands of the British market.

The CHAIRMAN. But suppose he were supplying it at a price which his competitor regarded as a competitive price, and which the competitor felt he could beat?

Mr. LANGNER. I don't think he would get very far with that. The competitor would have to show that in order for the competitor to be able to secure a compulsory license, that patent had been used to the general abuse of British industry.

Now we have some cases which are very illuminating on that point. We have three cases in England where one British company tried to get a license from another British company.

The CHAIRMAN. Of course, specific cases would be much more illuminating than hypothetical cases.

Mr. LANGNER. I am going to try to give them to you because I think you would be interested in them because they relate to these same tubes you were examining this morning. Two out of three of these cases applied to such tubes which are called valves in England. The third case related to gramophone records. In that case, they have over in England cooperative stores which are chain-store cooperatives which sell at a lower price than regular stores, and the Columbia Gramophone Co. refused to supply these particular stores because they were then able, with these benefits, to undercut their other customers. This particular group of stores brought an application for compulsory license and the court turned them down. The court

refused to grant them a license because they claimed that the company was supplying these records through recognized stores and that they have a perfect right not to give a license to somebody if they didn't want to.

Representative SUMNERS. Would it interrupt for me to inquire so we can go along together—, is this license the license to buy or the license to manufacture; I mean the privilege to buy or the privilege to produce?

Mr. LANGNER. They wanted the privilege to manufacture a competing record, you see.

The next case—as I explained there were two cases relating to valves—was a case which was brought by a German company by the name of Loewe for a license from the British Marconi Co., which corresponds to the Radio Corporation in this country. They came over to England, this German company, and they wanted to put up an establishment in England and they asked for a license. The Marconi Co., which had a policy of granting licenses under such conditions, got into an argument with them as to the amount of the royalties, and during the arguments they applied for a compulsory license. The court held that the British Marconi Co. had not refused to grant a license, and they threw the case out, telling them to go back and settle the matter among themselves, and no license was granted.

The third case is the most interesting case of all and I think will be the most interesting to you, because this dealt with the pooling of patents in a sense, perhaps even to a greater extent than has ever been thought of in this country. In that case the Marconi Co., on these valves or amplifying tubes, refused to grant a license to a certain outfit, a manufacturer called the Brownie Radio Co. They had an argument over terms of the license and the radio company refused to modify its conditions that it had with its other licensees, whereupon the Brownie Co., an English company, brought an action for a compulsory license. You must remember that in this case there was no question of the goods being manufactured mainly abroad. These goods were being manufactured in England and there were plenty of British manufacturers manufacturing the goods, but they were all manufacturing under an agreement with this Marconi Co. I think the case is so interesting that I would like to read to you from the judge's decision because it is about the only decision that we have in England on this question of pooling of patents.

It is very short.

The Chairman. What was the complaint of the Brownie Co.?

Mr. LANGNER. These people had refused to grant them a license and the Marconi people in turn took the position that they did not want to do business with this man they refused.

The CHAIRMAN. Was it the position of the Brownie Co. that if it got a license, it would put the device on the market at a lower price than the Marconi Co. and its licensees would make it?

Mr. LANGNER. I don't believe that was so; no, I don't think that was involved.

The CHAIRMAN. Then was it merely a question of Marconi not wanting to recognize this particular manufacturer for purely personal or arbitrary reasons?

Mr. LANGNER. I believe they were engaged in making a very cheap set; they had been manufacturers of what they called crystal radios,

and they had stuck to that until this other system, that is, the tube system, had come in, and then after staying out for quite a while they wanted to come in and take a license and the same license was offered to them which was offered to the other people and they refused and said that the terms were unreasonable, and applied for a compulsory license on more reasonable terms.

The judge, in deciding the case, made this statement:

First, is it in the public interest that a license should be granted? I put this consideration first because each of the parties who have argued the matter before me have put this forward as the first and paramount consideration. The learned controller—

that is the commissioner who decided the case in his department decided it in favor of the Brownie Co.—

Representative SUMNERS (interposing). Is that the court of last resort?

Mr. LANGNER. This is the court of last resort in this matter. [Continues reading:]

The learned controller has answered this question in the affirmative on this narrow ground. The Marconi Co. has secured what he calls a supermonopoly by aggregating in its hands all the vital patents controlling the manufacture of broadcast loudspeaker receiving sets, that is, valve receiving sets, and has licensed a large number, over 2,300, of manufacturers were engaged in the vast trade of manufacturing such valve receiving sets, and has therefore precluded itself from proceeding arbitrarily to grant any license to a particular manufacturer, while, as the controller puts it, granting licenses to his competitors.

Do you get that point?

The CHAIRMAN. I hope so.

Mr. LANGNER (reading):

The learned controller goes on to state that such an arbitrary exercise of monopoly rights seems to be contrary to every principle of public policy. I cannot agree with this view. In the first place, the Marconi Co. is entitled to such monopoly rights as flow from the ownership of the patents it has acquired; such rights are no greater and no less by reason of the fact that the patents were acquired by assignment or purchase rather than by original application or by reason of the fact that the patents are contained in a number of grants instead of a single grant. It is admitted that a patentee is entitled to work his invention either by himself or his licensees. He may limit the number of his licensees and he may select such licensees at his own free will and pleasure, subject only to this, that he must not abuse his monopoly rights. If the patent is in fact being worked in such a way that the public demand is being supplied to an adequate extent and on reasonable terms, no one can complain, and public interest does not in such circumstances require that a particular manufacturer who desires to manufacture and sell the patented article should be granted a license so to do. Indeed, the public interest may itself require that the number of licensees shall be limited, because it may well be that the public interest is best served by insuring a steady supply of the patented article by preventing the flooding of the market and a drastic reduction of price by wholesale competition. The question to be determined in the present case is not whether any license should be granted but whether a license should be granted to a particular person. In my view there is nothing on the evidence or in the circumstances of this case to establish that it is in the public interest that a license should be granted to the applicant, the Brownie Co.

The CHAIRMAN. That, of course, was the contention of the Hartford-Empire Co. when the glass industry was before us.¹

Mr. LANGNER: I don't know about that particular point in this country, but in England, even with a compulsory-licensing law, the court (and this is the court of last resort on this point) has decided that the mere fact that a man has given 15 licenses doesn't mean that he is forced to give 16, 17, or 18.

¹ See Hearings, Part II.

The CHAIRMAN. As I recall the language of the court, it was to the effect that the patentee under the British compulsory-licensing law has the right to limit the number of licenses, so long as he doesn't abuse his patent monopoly. Now, what constitutes abuse?

Mr. LANGNER. Well, I don't think—may I go back to the beginning of your question—that this is under the British compulsory-licensing law. This is under the British law; it has nothing to do with compulsory license. Under the British law they have set up a group of licensees.

The CHAIRMAN. I misunderstood, I thought that Brownie Manufacturing Co., whatever its proper name is, had applied to the controller, who is the Commissioner of Patents for Great Britain, to compel the Marconi Co. to grant them a license.

Mr. LANGNER. Yes.

The CHAIRMAN. I thought that application was under the compulsory-licensing law.

Mr. LANGNER. That part is correct. The setting up by Marconi of its group of licensees was not under the law; that was what I was trying to explain; that was not under the law.

The CHAIRMAN. Oh, I see.

Mr. LANGNER. Now, as to what would under those circumstances constitute an abuse of the monopoly rights I have no way of telling, because since 1919 there has never been a case of this kind where they have held there was an abuse.

The CHAIRMAN. I mean so far as the language of the statute is concerned it is wholly a judicial question?

Mr. LANGNER. Yes.

The CHAIRMAN. As to what constitutes abuse?

Mr. LANGNER. As to what constitutes abuse, and they have never held that as being done in England. I would like to add this: that I believe, as I have explained to you, that the purpose of this compulsory license law in England and in other countries has been to try to handle a different kind of abuse rather than this rather modern conception which didn't really exist in those days. If you will remember, in England at that time the whole policy of the country was free trade and they had no tariff system; they were trying to cure something that their tariff allowed; it allowed these chemicals to come in from other countries and goods to come in on a free-trade basis, and they were in a very difficult position as free traders; they couldn't put up a tariff; they tried to make the patent law handle the tariff situation, and in the taxes on patents they were trying to make the patent law handle a revenue situation. In both of those cases they subtracted from the patent monopoly. Now, what is the effect from a practical standpoint on this? It seems to me the effect is this: that you have so many restrictions on the patent that when you try to make the patent take care of the tariffs and take care of revenue you reduce the incentive to invention and you reduce the research that is done. I don't think that we can find in the European countries anything like the amount of research that goes on in this country, with perhaps the possible exception of the German chemical industry. There is nothing like the amount of research being done.

Representative SUMNERS. In the English policy they recognize the right of the patentee to a monopoly, insofar as domestic policy is concerned, as I understand the testimony, but do not permit him to use that power of monopoly to abuse and hurt the public interest.

Mr. LANGNER. Well, the words "public interest" isn't the expression; "abuse the monopoly rights" is the word.

Representative SUMNERS. But they give him a monopoly. The purpose of a patent as recognized insofar as domestic policy is to give him the monopoly.

Mr. LANGNER. Yes.

Representative SUMNERS. But the right and power which the government gives to the patentee may not be used oppressively insofar as the general public of Great Britain is concerned. Is that about the situation?

Mr. LANGNER. Well, it depends on what you mean by the word "oppressively." That has so many interpretations.

Representative SUMNERS. Sell it for an extortionate price. Would that get it down somewhat more narrowly?

Mr. LANGNER. There are no decisions on the subject. There has never been a case.

Representative SUMNERS. Can you give us some idea as to their philosophy, what motivates their policy? If you will pardon me, we understand that insofar as the major policy, the major motive, if I may use that expression, resulting in compulsory license is to prevent somebody from the outside coming in and taking the business. Maybe you wouldn't like to say that, but I express it that way.

Mr. LANGNER. Yes.

Representative SUMNERS. Now, then, as among Britishers is it the policy to grant as an incentive to the inventive genius, a patent, which patent shall be the right to the exclusive use and privilege of producing that article, but they mustn't go so far as to, as we say in America, hold up the public?

Mr. LANGNER. Well, sir, when you speak of charging extortionate prices or any of these other features, as I have said before, it is difficult to answer you because we have had only three court decisions, but I want you to bear in mind that the fact that we have had only three court decisions is a very significant fact. If it had been considered by British lawyers that they would have been able to get a compulsory license on the ground that the price that was being charged was too high, I think you would have found far more cases than you have found in 19 years. In other words, I cursorily think that that would not be an abuse of the monopoly, the mere fact that you were charging a high price, because, after all, that is the way you are getting your reward from your invention; if you charge too high the public won't buy from you, and therefore you get your own punishment without a compulsory license.

Representative SUMNERS. But wouldn't you make the policy work at cross-purposes by driving the British buyer to a foreign market to get his commodity? I don't want to argue, I am just trying to get the picture in my own mind, and I assume my colleagues here would like to have it. Here we have a situation where something is said about compulsory license, and the only definite explanation we have is that the purpose of that law is to prevent somebody from beyond the realm getting the money. But is there no domestic policy, no policy that is of concern to those who fix its public policy and who grant the right of exclusive use to prevent an abusive exercise, if I may use that expression, and I use the word "abusive exercise" in charging what would be far more than a fair profit in manufacturing? Is there any policy?

Mr. LANGNER. No, sir; I think there is no such policy. I think that if somebody went to an English lawyer and said, "Do you think we could get compulsory license under those conditions?" the English lawyer would say "No."

Representative SUMNERS. Let me state it again. You have some general policy against monopoly in England, I suppose. Do you or not?

Mr. LANGNER. That is corresponding to your antitrust laws?

Representative SUMNERS. Yes.

Mr. LANGNER. Yes.

Representative SUMNERS. Would you be able to go into an English court—let me state it this way: If you went into an English court, alleging the fact which would constitute an abuse of what we call our antitrust laws in this country, would the defense be good that the goods were being manufactured and sold by a licensee of the patent? I think that is about as clearly as I can put it.

Mr. LANGNER. I really couldn't answer that question.

The CHAIRMAN. Can you give any example of a case in which you as an expert in patent law would be willing to advise a client who came to your office that you could secure for him or that you would be willing to prosecute for him a case under the compulsory licensing law upon the ground of an abuse?

Mr. LANGNER. I would have very great difficulty in advising him except in the case where the goods were being manufactured abroad.

The CHAIRMAN. In other words, so far as your opinion goes, the compulsory licensing law in England does not set up any abuse that the controller or the courts would recognize except in the case where the goods are being manufactured abroad and there is no British licensee.

Mr. LANGNER. No, sir; I didn't say that, I simply said that the decisions that we have had to date under that law as to what constitutes an abuse of monopoly all indicate that the controller only considers these foreign abuses; when I say controller, the controller and the court, only considers that and he has thrown out every other.

The CHAIRMAN. That was quite clear. We understand there have been very few decisions, but what I am trying to ask you is: Can you give us your opinion as to what would constitute an abuse which ought to be recognized by the court, under the present state of British law?

Mr. LANGNER. No; I could not give an opinion on that. It would be purely hypothetical. There are conditions that are complained of in this country in relation to pooling of patents that would come under antitrust legislation in this country that might conceivably lead to somebody saying, "Here is something going on and we want a compulsory license to cure it," but that has not happened. It might. I couldn't tell you how you would get off under the British law under those conditions.

The CHAIRMAN. You as an expert in international patent law cannot now think of an abuse which in your opinion would be cognizable by the courts under this law in Great Britain.

Mr. LANGNER. I would have difficulty in thinking of such an abuse.

The CHAIRMAN. We are fortunate this afternoon in having with us the chairman of the Senate Committee on Patents, Senator Bone of Washington. He has just indicated to me that he would like to ask a question.

Senator BONE. Our own court has banned unreasonable competition in restraint of trade. Is there any parallel between that judicial concept and the attitude of British courts toward the problem you described?

Mr. LANGNER. I am not familiar with the British legislation corresponding to our antitrust legislation.

Senator BONE. Our court has referred to unreasonable restraint. I wonder if there would be any connection in the international approach to this problem.

Mr. LANGNER. If I may explain my point of view in regard to this situation, I believe that the English system has gone wrong in the sense that it punishes the patent owner for what I might call a tariff offense, if you like, by subtracting from his monopoly. I think that it has gone wrong in putting taxes on it. I think in this country that we should not subtract from the patent monopoly for an anti-trust offense. I think if patents in this country are being used for unreasonable restraint of trade, that the remedy lies not in breaking down the patent monopoly, not in reducing the incentive to invention, but in strengthening your antitrust laws to prevent the unreasonable use of patents, if I may express myself that way. My experience with the European practice leads me to say, don't punish a man under the patent law for offenses that he commits under the anti-trust law.

Senator BONE. Do you think that the ultimate price of an article to the general public ought to furnish some standard of whether or not it is a reasonable exercise of the patent monopoly, because after all isn't that the supreme test what the general consumer public have to pay for an article?

Mr. LANGNER. Not always, sir. If I may say this to you, millions of dollars, as has come out here today, are gambled on an invention. That produces a new article, let us say, which is sold to the public that has to return not only the investment but in order that the risk is worthwhile it has to return a little more than that in order to keep the profit incentive. Now if you are going to say that the price at which it is sold to the public is the only thing that has to be considered I would say yes, plus something that makes that gamble worthwhile for the inventor, and for the people back of the inventor, and the public does not actually have to buy that invention necessarily. It is in very few fields that the invented device is the only device in that field. Probably the invented device is a better device, that is it is nice, it is more ingenious, it is cleverer, and you are usually willing, in order to get the latest thing, to pay a little more for it, so for that reason, sir, I don't entirely agree with your idea.

Senator BONE. I am not suggesting that as a remedy. I am merely inquiring to explore this field.

I wanted to ask you another question, suggested by one of your answers. Assume that there is a British patentee and another citizen of Britain applies for the use of that patent, it being a purely domestic patent, does your compulsory licensing system over there permit one citizen to apply for the use of the patent of another citizen of Great Britain?

Mr. LANGNER. Yes, sir; it does.

Senator BONE. Precisely as they would apply for the use of a patent of a German?

Mr. LANGNER. Yes; it does, but in these 18 years only three have done so, and of those three not one was given a license. That is what I was trying to explain.

Senator BONE. That must be a very vague thing if lawyers cannot understand it any better than that.

Mr. LANGNER. It is surrounded by so much protection for the patentee and the judges are always so loath to let someone come in under it, and as I explained to you, I have given you the three cases in detail and my feeling about the situation of what you can learn from it is that we have a system here which is the greatest stimulator of invention in the whole world. The reason that it is the greatest stimulus for invention is because it is an unconditional monopoly. Now, if people take this wonderful patent that we give them and by conspiring together, by schemes and plots, they do something with that that they should not do, make that the wrong thing, make that the thing that you do. Don't subtract from the patent itself. It is like this, which is a good illustration. Supposing I have developed a fine shovel, and you buy it from me and then you use it to hit somebody with. Now don't make a law which says that every shovel shall have a hinge in it so that when you aim it to hit somebody the shovel will have a bad aim. Just make a law that does not allow a wrong use of it. Now that is the way I feel about compulsory licensees.

Senator BONE. I have one more question. Does the official in Britain whose duties roughly correspond to those of our Commissioner of Patents, have a continuing jurisdiction where the use of a patent is granted to an applicant? That is to say, can he from time to time change the royalties dependent upon mass production, consumption upward, and what not, or is his order with respect to the royalties *res adjudicata*, so to speak?

Mr. LANGNER. No, sir; I think that is always subject to change, and I would like to explain one other feature to you and that is under the British law if you want to avoid paying half these taxes, we have a curious provision which is not very often used, and that is a patentee may go into the patent office and write on his patent "License of right." Now, if he writes "License of right" on his patent he only has to pay half the taxes, and that means that anybody can get a license. Well, how does the thing work out, practically? Practically, no patent lawyer in England ever—there may be one or two concerns in England that ever advised their clients to do such a foolish thing. I have right here with me a case where—I will tell you about it; I do not need to refer to it—an application was made to strike out the words "License of right" from the British patent and the reason they gave was this. Somebody was willing to back this invention but they would not put the money up to put up a factory unless that license of right was stricken off the patent. Somebody opposed it, and the British controller held that the words should be stricken off because that was the only way they could get this money invested behind the patent.

Which goes to prove what I have been saying to you, that if you want to get people to invest in a patent, give them an absolute monopoly and make them behave afterwards.

The CHAIRMAN. Commissioner Lubin, do you want to ask a question?

Dr. LUBIN. I was very much interested in these three cases that you cite. Am I correct in assuming that these were three cases that came before the courts and adjudicated?

Mr. LANGNER. Yes.

Dr. LUBIN. Now is there any record of any decisions made by the controller relative to applications for compulsory licenses where he has ruled in favor of the applicant and the person who owned the patent had not appealed to the courts?

Mr. LANGNER. In certain of those decisions no appeal was made to the court but not in the cases where it was one British concern against another concern. They were mostly cases of foreign manufacture.

Senator BONE. In other words, there were no instances where people have made application for compulsory license and had the application granted that have not been appealed to the courts?

Mr. LANGNER. No instances where one British firm asked for a license from another British firm. There were only three cases, and they all went up to the courts.

Senator BONE. In your opinion, does the fact that you have a compulsory license system in Great Britain lead manufacturers to grant licenses more freely because of the fact that then after this they do not—the case may go to the controller and eventually to the courts and they might have to grant a patent?

Mr. LANGNER. I think it has a certain bad effect. I think that when a man who has an invention is approached, he feels that if he does not give the license—and it may be to a very big company that wants the license—he is always afraid that if he does not give it to them very cheaply he may be hauled up to Court. On the other hand, as time goes on we are beginning to see more and more that this law is a dead letter, which is perhaps raising the courage of the individual small manufacturer.

But it is a cloud on the title; that is, it does make the man afraid, especially the little man, that he is going to be hauled through expensive litigation if he doesn't give a license.

Dr. LUBIN. Of course, it may also have the effect of having a big man give a little man a license if he knows the little man can force the fight.

Mr. LANGNER. Yes; but the little man isn't in such a good position to fight.

Dr. LUBIN. I was very much interested in your approach to the problem of licenses and patents as a device for solving problems that should be solved in other ways. You mentioned the case of the Sherman Act and using patents for revenue purposes and things of that sort, and you recommended that in the event of the abuse, let's say, of our monopoly laws, we should approach the problem not through the patent end but through the Sherman Act end. We have heard a lot here in recent weeks about people taking out patents apparently for the purpose of keeping somebody else from improving another patent. The term used was "fencing in," people making an improvement on an existing patent which they didn't own, taking out a patent to prevent the competitor from improving his own patent.

There you don't have collusion in the sense you describe it. Is there any way of approaching that problem through any device other than the patent law?

Mr. LANGNER. Well, sir, it seems to me that if it is an unfair trade practice you have laws that deal with unfair trade practices. It isn't the fact of inventing and taking out a patent that is the wrong, it is the fact that it is then used to hurt a competitor, which is the way the patent is used, not the patent itself.

Dr. LUBIN. Well, it is the absence of use of the patent.

Mr. LANGNER. Yes; and I think that it might come under the general classification of an unfair trade practice.

Dr. LUBIN. Do you feel that foreign corporations come here to take out patents in order to prevent American manufacturers from using certain devices and methods?

Mr. LANGNER. I think there may be a certain amount of that in the chemical industry, but you would have to practically go into each individual substance, because as you know, the chemical industry has so many ramifications that very often a substance is produced in Germany because Germany is the most economic place for that particular substance to be produced, and by tariffs we can, generally speaking, force the bringing in of industries where, if the price is too high, American goods will compete.

Dr. LUBIN. One more question, if I might ask it. I was very much interested in what you said about the place of invention in American life, particularly as it affects the standard of living of the American people, and more particularly the part that our patent laws play in stimulating invention in America. You have said that people have come here because of our patent laws and developed new inventions, and the American has been more ingenious in part because of patents.

I don't think there is any denying the fact, but how important do you think that factor is as compared with the fact that the American standard of living, the American attitude toward life, is such that if you do invent something, you can sell it? You talked about the electrical refrigerator, air cooling of cars; the fact that we have an installment system, we have an advertising system that stimulates demand—isn't that much more important than the fact that you can get a patent on a product you have? After all, with a poorer patent system you still would have the stimulus to do things here that you don't do in other countries because you know you can make money by it, whereas in other countries the standard of living is such that there is no incentive for doing it.

Mr. LANGNER. It is like "Which came first, the chicken or the egg?" I claim the standard of living in this country is such because of the patent system and inventions. Through our mass-machinery methods and so on we have been able to pay our workers much higher than other countries and to hold up that price in world markets with our goods, therefore, I say that it is, "Which comes first?"

Now, following that comes the fact that we have the money to buy these things from our inventors.

Dr. LUBIN. The same inventions, the same technics, the same machines, are available in other countries. Despite their patent system, people can use our methods.

Mr. LANGNER. And they usually do, 7 or 8 or 9 years afterward, but they don't originate them. It is much easier to sell an American invention in Europe than it is to sell a European invention. I will tell you why that is: Because when an Englishman comes to an

English firm with an invention it is usually just an idea, but when an American goes over there he has 2 or 3 years of development work behind it, and the English company doesn't have to spend all that money on development work.

The CHAIRMAN. We had some testimony here at one of the earlier sessions, Mr. Langner, which indicated that in one industry, at least, there was an international agreement of cross-licenses which was in effect being used as a substitute for the tariff, not as a revenue-producing measure but as a measure for excluding the products of another country.¹ The testimony had to do with the glass industry, and we were told of an agreement between certain manufacturers in Italy and certain manufactures in the United States by which the exportation of Italian manufactures into the United States was limited.¹ In your experience, as an international patent lawyer, have you had any examples of that kind?

Mr. LANGNER. That is very common, sir, in the sense that most Americans who license abroad don't want those goods shipped into the United States. Now we have quite complicated license agreements; for instance, I have just been looking at one recently in connection with airplanes. An airplane must be free to fly in every other country. The same is true of automobiles. They must be free to travel in other countries, so they have to work out a system of licensing by which they license to manufacture in one country, but to use them in all countries.

The CHAIRMAN. In other words, by our American patent system we have developed an arrangement, a condition, under which the holder of a 17-year monopoly from the United States Government, that is to say from the people of the United States, may issue a license to a foreign manufacturer to use that device, that patent, for the manufacture of the device in a foreign country, provided he doesn't export it to the United States.

Mr. LANGNER. That is, the American patent system itself does that. You see, although he has given him the right, under the Italian patent, to manufacture and sell in Italy, the moment that device comes into the United States it becomes an infringement of the American patent, if it is a patented device. If it is an unpatented device, it is not an infringement.

The CHAIRMAN. But if it is the same device, licensee A has a patent. He grants a license to B, an inhabitant of Italy, let us say, or an Italian corporation, to manufacture this device, which is covered by his patent.

Mr. LANGNER. In the United States.

The CHAIRMAN. Yes.

Now, is that same device, manufactured under that license which is issued by virtue of the American patent, an infringement of the patent which brought it into existence?

Mr. LANGNER. That license could never have been issued under the American patent, because the American patent doesn't extend to Italy. It must have been issued under the Italian patent, and the moment those goods, if they are patented, leave Italy and come into the United States, they constitute an infringement of the United States patent.

¹ See Hearings, Part II, p. 660 et seq.

The CHAIRMAN. So that if manufacturer A in the United States, holding American patents, enters into an arrangement with manufacturer B in Italy, who has an Italian patent for a similar, if not an identical device, and they agree with one another under a cross-licensing system to control exportation between the two countries, what, in your opinion, is the effect of that upon industry and employment and economic conditions generally?

Mr. LANGNER. Well, it might be that under those conditions a much more cheaply made European article would be imported into the United States, and there I would say the tariff would be the thing that should take care of it.

It might be, on the other hand, that if the situation were reversed, a great many American-made bottles would go into Italy, which would increase employment in this country. It would depend, it seems to me, on the way that thing was worked out in practice, but I feel a tariff can always correct that particular evil and should be administered to correct it.

The CHAIRMAN. You spoke of cross-licensing systems in the airplane industry. Can you think of any other industry? You said it was rather a common practice.

Mr. LANGNER. I wasn't speaking of cross-licensing. I was speaking of the fact that it was common practice in the airplane and automotive industries to limit the right of manufacture, but to allow the goods to be moved freely into other patented territory without infringing patents.

The CHAIRMAN. That is rather a liberalization than a restriction.

Mr. LANGNER. Yes; it is.

The CHAIRMAN. I was thinking of restrictions. Do you know of any restrictions?

Mr. LANGNER. Do you mean in international agreements?

The CHAIRMAN. Yes.

Mr. LANGNER. No; I don't, not any that I can recall offhand. Practically every agreement that we draft that deals with licensing limits the patent to the country—that is, the use of the invention to the country—in which the patent exists.

Senator BONE. Assuming and conceding the propriety and justice of giving the patentee the rights he has enjoyed under our patent laws, it is very evident that he couldn't realize anything out of his control of a patent unless the people bought it. He wouldn't even dare gamble, and therefore the public generally has a stake in that patent as much as the owner and holder of a patent, for without their patronage his patent wouldn't be worth the paper it was written on.

Approaching it with that viewpoint, which immediately thrusts into this picture the question of public interest—

Mr. LANGNER. I will tell you my idea about it. The way prices are brought down is by competition, by free competition, competition of inventions, one against another. You have heard testimony here about how that works out. Price raising under patents can only take place, in my opinion, that is general price raising, where, for some reason or other, the competitive system no longer exists, and I think that invariably you can divide such types of price raising under two groups: No. 1, the case where price raising is done, maintenance of pricing, under a perfectly valid patent, a very good patent; and the other case where perhaps it is done under a patent that isn't valid,

I think that if price maintenance is made under a perfectly valid patent you are going to suffer for 17 years somewhat of the inconvenience of having to pay more for that article than you would have if there were free competition, but in return for that you have obtained from the inventor this tremendous investment in energy, in individualism, which after all we are trying to continue under our system of government, you have this thing that encourages people to put up the money, and under those conditions my feeling is that if it is a good patent and a good invention, that man should be allowed to charge perhaps more than he would with competition. However, if there are systems set up whereby a number of people get together under patents that are ambiguous or not what they should be, patents that there is so much question as to the validity of, and make agreements that they are all going to sell the articles at their own price, you have your remedy under the antitrust laws.

SENATOR BONE. If you concede the right of the owner, the holder of a patent to retain in all its purities the monopoly the law gives him, it seems to me your antitrust laws are nullified to that extent. I practiced law all my life, and I can't follow those two thoughts in their parallel columns and reconcile them, because if the law on the one hand gives a man a monopoly right, I want to be realistic enough that we might as well throw the antitrust laws out of the window if we are going to recognize the right of a man to do what he pleases with his patent. This is not an argument; it is one of the reasons why this inquiry is being conducted.

MR. LANGNER. My reply to that is this: That where we have decided, that is, the framers of the Constitution in their wisdom decided, that in order to encourage invention and the promotion of the useful arts and industries, that there should be this monopoly for 17 years in order that after that the public might have it for perpetuity, that is the bargain, and it seems to me that you don't have to throw your antitrust laws in the wastepaper basket at all. That monopoly is all right. That is where that man is going to get his reward. There is nothing the matter with that.

THE CHAIRMAN. Wouldn't it be proper, if I may interrupt you, to say that the patent monopoly does not arise by virtue of—I don't want to use the word "virtue"—a combination or conspiracy, which is the thing the antitrust law prohibits?

MR. LANGNER. That is exactly it, and if patent monopolies are used as part of a conspiracy, that is another matter entirely.

THE CHAIRMAN. The antitrust law would apply in the case where a patent was the basis of a conspiracy or a combination in restraint of trade, and there is nothing in the patent law that prevents the operation of the antitrust law in such a case, that I know of.

SENATOR BONE. One would not have to conspire where he has the whole thing in both of his hands? No.

MR. LANGNER. Then I say he has not committed a wrong.

THE CHAIRMAN. As the witness has stated, and if I understand his position, it certainly is mine, it is decidedly in the public interest to hold out to inventive genius the certainty, as far as our patent laws go, that that genius will be rewarded by a complete monopoly for a limited period of years, in order that we may get the benefit of every invention that may possibly be devised, but at the same time it seems to be, I think, general agreement, certainly among the wit-

nesses who have appeared to date, that no device should be permitted to extend unduly the period of the monopoly, and that is the reason why the Commissioner of Patents has recommended that there should be a specific limitation to 20 years, and that devices which are used for the purpose of extending monopoly are not in the public interest.

Senator BONE. You heard Mr. Coe's testimony, where so many of these things have been projected over 40 years.¹ Would you consider that an abuse of the patent laws?

Mr. LANGNER. Very definitely, and it is not possible for that to happen in foreign countries.

Senator BONE. Evidently there has been some laxity in this country, in that respect, under our statutes.

Mr. LANGNER. No, I do not think it is laxity; I think it is due to the fact that in our great desire to preserve the rights for the inventor we have allowed complicated procedures of interference to grow up, but in the 25 years since I have been in this country it has been getting better all the time. Mr. Coe has done a wonderful work in getting patents out of the Patent Office much quicker than used to be the case and what was common practice when I first came to this country 25 years ago is the exception to the rule today. I think I am correct in stating that.

Senator BONE. I am assuming of course that whatever the cause of this it must rest ultimately on the wording of the statute, attributed to Mr. Coe and his Department, but to the wording of the statute which permits that sort of thing to continue, if it be a wrong. Therefore our inquiry, it seems to me, might legitimately be directed toward the wording of the statute so if there be abuses we can correct it so the courts could not authorize or permit or seem to countenance that sort of thing. My own questions are not intended to indicate my own state of mind; I want information about this business, but I suspect that our beloved ancestors in this country could hardly have contemplated this technological age in which we live and envisioned the possibilities of monopoly and abuses none of which I assert here, but obviously they are here or we would not be having this inquiry. But they could not possibly have envisioned the tremendous growth in our industrial life, the use of machinery, the scientific achievements and gadgets of this age, else probably they might have had somewhat a different slant to it.

Mr. LANGNER. I think they thought very clearly on one point, and that was they thought very clearly on the fundamental idea of how you should encourage an invention, and I think, they thought much better than most of the people who had to do with the formulation of the European patent systems. I think that is evidenced by the results and those results are due to those men who thought out the Constitution and their ideas were good.

Senator BONE. Have you contemplated the drafting of any suggested amendments to the act?

The CHAIRMAN. Mr. Langner was invited here, Senator, to comment upon the foreign laws and not so much to make suggestions with respect to our own.

Are there any other questions, Mr. Dienner?

Mr. DIENNER. No, Senator.

¹ Supra, p. 853.

The CHAIRMAN. Any other questions by members of the committee? Do you care to state now who will be your witness tomorrow morning?

Mr. DIENNER. We shall put Mr. Carlton, C. C. Carlton, on the stand. He is an automobile parts manufacturer and will present the picture, typical picture, of that industry. Then we hope to have further Mr. Baekeland, who will present the picture of plastics, the plastics industry.

The CHAIRMAN. Thank you, Mr. Dienner. Mr. Langner, the committee is very much indebted to you for your testimony this afternoon. We thank you for appearing here. The committee stands in recess until 10 o'clock tomorrow morning.

(Whereupon, at 4:45 p. m., a recess was taken until 10 a. m. Friday, January 20, 1939.)

INVESTIGATION OF CONCENTRATION OF ECONOMIC POWER

FRIDAY, JANUARY 20, 1939

UNITED STATES SENATE,
TEMPORARY NATIONAL ECONOMIC COMMITTEE,
Washington, D. C.

The Temporary National Economic Committee met pursuant to pursuant to adjournment yesterday, at 10:30 a. m. in the Caucus room of the Senate Office Building, Senator Joseph C. O'Mahoney presiding.

Present: Senators O'Mahoney (chairman), and King; Representative Reece; Messrs. Patterson, Peoples, Thorp, and Coe.

Present also: Senator Homer T. Bone of Washington chairman of the Senate Patents Committee. Counsel: John A. Dienner, special counsel for committee; George Ramsey of New York, assistant to Mr. Dienner; Justin W. Macklin, First Assistant Commissioner of Patents; and Henry Van Arsdale, Assistant Commissioner of Patents.

The CHAIRMAN. The committee will please come to order.

UNITED STATES PATENTS HELD BY FOREIGNERS AND FOREIGN PATENTS HELD BY AMERICANS

The CHAIRMAN. When Commissioner Coe was on the stand a few days ago, at the opening of this phase of the hearing, he was asked by Dr. Lubin and I think some of the other members if he would be good enough to compile some figures from the Patent Office on the number of patents held by foreigners. The Commissioner indicates that he is now ready to present that material, and if you will be good enough to wait just a moment, Mr. Dienner, I think we will ask the Commissioner to put that material in the record now.

Mr. COE. Mr. Chairman, as indicated, interest has been expressed by members of the committee in the number of patents this country grants to citizens or residents of foreign countries. In order to answer the question, as well as others which might arise, I would like to introduce several tables into the record.

The first table shows the number of patents granted by the United States to residents of foreign countries for the 8 years 1930 to 1937. The annual averages are also given. Looking at the last column it is seen that out of the average number of 48,697 patents that we grant each year, 6,421, or 13.2 percent, are granted to residents of foreign countries. Just to mention a few of these countries—2,375, or 4.8 percent of our total, are granted to residents of Germany; 1,273, or 2.6 percent of our total, are granted to residents of England; 632, or 1.3 percent, to residents of France; 493, or 1 percent, to residents of

Canada; and other countries receive a smaller number of patents. These are all set out at length in the table.

(The table referred to was marked "Exhibit No. 210" and is included in the appendix on p. 1150.)

Mr. COE. The second table shows the number of patents which are granted by some foreign countries to citizens or residents of the United States. Figures are not available for all countries and only 11 are given in this table. As seen from the last or average column, Canada grants 6,161 patents to United States citizens. This is 66.5 percent of all patents granted in Canada. England grants, on an average, 2,685 patents to Americans, which is 14.6 percent of their total patents granted. France grants 1,540 patents, or 7.7 percent, and Germany 1,355, or 6.6 percent of their total. The other countries grant a smaller number of patents to Americans.

(The table referred to was marked "Exhibit No. 211" and is included in the appendix on p. 1151.)

Mr. COE. The third table is merely a balance sheet listing in parallel columns the patents granted by a particular country to Americans and the patents granted by the United States to residents of that country. The differences between these two figures are stated and from these it is seen that Americans receive more patents in foreign countries than those countries receive from the United States, except in the case of Switzerland and Germany. Germans receive 2,375 patents in this country and Americans receive 1,355 patents in Germany per year.

(The table referred to was marked "Exhibit No. 212" and is included in the appendix on p. 1151.)

Mr. COE. The fourth table is a list of the number of patents granted by a number of foreign countries (those which grant over 1,000 patents per year). These figures are annual averages for the 8-year period 1930 to 1937. This table also indicates the number of patents which some countries grant to foreigners. Thus, Germany grants 20,621 patents per year and of these 5,327, or 25.8 percent, are granted to foreigners. France grants about half of its patents to foreigners. Great Britain grants slightly more than half of its patents to foreigners; Italy, 63.8 percent. Canada grants a very high proportion of its patents to foreigners, namely 90.3 percent. A few other countries are noted on this table.

(The table referred to was marked "Exhibit No. 213" and is included in the appendix on p. 1152.)

The CHAIRMAN. Thank you, Mr. Commissioner.

Are you ready to proceed, Mr. Dienner?

Mr. DIENNER. Yes, sir, Mr. Chairman. We are now ready to call Mr. Carlton. Mr. Carlton, will you please be sworn?

The CHAIRMAN. Do you solemnly swear that the testimony you are about to give in this proceeding will be the truth, the whole truth, and nothing but the truth, so help you God?

Mr. CARLTON. I do.

**TESTIMONY OF CLARENCE C. CARLTON, VICE PRESIDENT, MOTOR
WHEEL CORPORATION, LANSING, MICH.**

Mr. DIENNER. Mr. Carlton, please state your full name and your business connections.

Mr. CARLTON. My name is Clarence C. Carlton. I am vice president and secretary of the Motor Wheel Corporation at Lansing, Mich. I am president of the Automotive Parts and Equipment Manufacturers Association, a trade association representing a large part of that industry. For 27 years I have been engaged as an official connected with the parts industry. During that time it has been my duty to supervise patents, their securing, prosecution, and management, and I have also been connected with sales practically all of that time.

The Motor Wheel Corporation is a manufacturer of wheels and automotive stampings. Wheels, as we talk about wheels, consist of the wheel itself, which you demount from your automobile, which consists of a rim and, at the present moment, a disk; the attaching parts that hold it onto the hub; the hub with its bearing liners inserted therein, and the brake drum attached thereto permanently. So that a set of wheels consists of two front hubs, with brake drums attached; two rear hubs with brake drums attached; bearing liners are pressed in ready for the bearings, which are attached to the axle shaft; the wheel with its rim attached permanently; and the attaching parts, either cap screws or bolts and nuts to hold them on.

So when I mention wheels hereafter, I shall also consider that wheels mean all of those things that we are talking about.

At the beginning of the National Industrial Recovery Act it became necessary, almost, for industry to get together and find out who they were, and this industry didn't know much about itself, and so a meeting of the leaders of the industry was called and we found that we didn't know the members of our industry, how many of us there were or who we were or where we were located, and this organization known as the Automotive Parts and Equipment Manufacturers Association was organized in 1933, and I was selected as the executive vice president of that association, and Mr. Charles Davis, president of the Borg-Warner Corporation of Chicago, became its first president and I succeeded him a year later as president and have been ever since, the president of that association.

The CHAIRMAN. What do you call the association?

**THE AUTOMOTIVE PARTS AND EQUIPMENT MANUFACTURERS
ASSOCIATION**

Mr. CARLTON. The Automotive Parts and Equipment Manufacturers Association. The word equipment gets into the name because of the manufacture of shop equipment and service tools that go along with the automobile.

Mr. PATTERSON. Can you name just four of the companies that are in the association so I have them clear in my mind, three or four of the outstanding companies?

Senator KING. While you are giving that, will you give us the number of organizations that are members of the association, if you know?

MR. CARLTON. Yes; we have 375 member plants at the present time who employ 200,000 employees. I can give you some of the leading names of the people in just one moment. Possibly the best way to answer your question, Mr. Patterson, would be to give the names of the board of directors because those people would probably be representative, inasmuch as they are elected by the membership at large. The board of directors consist of Mr. C. S. Davis, president of the Borg-Warner Corporation of Chicago; Mr. M. C. DeWitt, vice president of the Champion Spark Plug Co., of Toledo; Mr. Hugh Weed, Carter Carburetor Co., of St. Louis; Mr. C. E. Wilson, vice president of the General Motors Corporation, Detroit; Mr. D. W. Rodger, vice president of the Federal-Mogul Corporation, of Detroit; Mr. C. C. Bradford, president of the Eaton Products Co., of Cleveland; Mr. Dan Kelly, vice president of the Electric Autolite Co., of Toledo; Mr. E. F. Deacon, president of the Climax Engineering Co., of Chicago; Mr. J. E. Otis, Jr., president, Stewart-Warner Co., of Chicago; Mr. J. P. Mahoney, vice president of the Bendix Corporation, South Bend, Ind.; Mr. Charles Getler, president of the Houdaille-Hershey Corporation, Detroit; Mr. F. C. Crawford, president, Thompson Products Co., Cleveland; Mr. E. A. Hall, president of the Hall Manufacturing Co., of Toledo.

MR. PATTERSON. Thank you; that satisfies me as to your qualifications.

MR. CARLTON. The parts industry, of which I shall speak today, consists of three main divisions, the original equipment division, whose products are sold to the manufacturers of automobiles; the replacement parts division, whose products are sold either as service parts or replacement parts for those parts of an automobile which wear out; and the accessory division, which manufactures convenient gadgets which the car owner purchases after he has bought his automobile, which add to his convenience and comfort.

I will not discuss at all the shop equipment and service tools division, and so we will discuss really the automobile parts division rather than referring to the equipment division today.

The function of this association of which I am president is to collect statistics on employment, wage rates, and sales, and make all of these statistics available to all members of the association in every possible division and classification. We maintain a legal department. We advise our members on all types of national and State legislation affecting our industry, and we maintain a labor relations department. We have no business and no connection whatever with sales or costs or selling prices.

I am not authorized officially to speak for this association, and naturally I am not authorized to speak for any other company than my own. But I feel that after 27 years in the industry and having been president and executive vice president of the association for 6 or 7 years, I do have a very intimate knowledge of what is going on in the association, and at a very recent meeting the entire subject of patents and their relations to this industry was discussed very fully, and I was very happy to find that my personal ideas coincided fully with the ideas of all of the members of the industry.

I might say, therefore, that I am sort of an unofficial representative of this association here today, with their full knowledge and consent.

The 375 members of this association are located in 23 States of the Union and in 139 cities. If a circle is drawn with its center in Detroit,

Mich., a circle 600 miles in diameter, 73.6 percent of the number of manufacturers in this industry and 97.7 percent of the employees of the industry are located within that radius.

Senator KING. Which would be the outer rim westward, beyond Chicago, of course?

Mr. CARLTON. Yes; it extends beyond Buffalo, beyond Pittsburgh, beyond Chicago, beyond Milwaukee, north of Lansing, Mich., south of Cincinnati.

The majority of the members of this association, of these 375 members, employ less than 100 employees. We represent employers of as few as five and we represent employers with as many as 10,000 employees.

You would be interested to know that in the election of the board of directors for each \$100,000 of sales, or fraction thereof, a member has one vote. Those votes are audited by Ernst & Ernst, and it is interesting that every year since the association was organized, if each member had had just one vote regardless of size, the result of the election would have been exactly the same. I mention that in order to show you that there has been a perfect unanimity of opinion and that no large group of employers, or no large manufacturer or group of manufacturers, is in any way dominating this industry.

The last available sales figures for this association are as of June 30, 1937. The figures reported at that time to this association showed sales of \$800,000,000 by the members of this association. I wouldn't have you believe that all manufacturers of automotive parts belong to this association, because there are at least as many more who do not belong to the association as those who belong. Those who do not belong, however, are practically all replacement parts manufacturers who depend for their business upon going through catalogs and determining what parts of the three leading automobiles wear out first, and duplicating those parts and selling them to garages and service stations as replacement parts.

Senator KING. Have you any figures showing the proportion of sales made by this second organization, the proportion of the eight hundred million?

Mr. CARLTON. That eight hundred million are the sales of this particular association, Senator King.

Senator KING. What are the sales of the other organization?

Mr. CARLTON. I can only guess at that. During the N. R. A. days we tried to estimate the sales of the entire industry, and we felt sure that it was a billion dollar industry, and therefore, I believe that it is possible that the sales of those members of the industry who do not belong to this association may total \$200,000,000.

Senator KING. Then, of course, with the increase in the use of automobiles, there would be an increase in the demands for parts, and therefore, there would be an increase in the output of the second organization.

Mr. CARLTON. That is right. Of this \$800,000,000 of sales, 83.5 percent are original equipment sales, and therefore it can be said that this parts association of which I am president sold last year \$650,000,000 worth of parts to the manufacturers of automobiles and trucks.

Mr. DAVIS. Mr. Carlton, do any of those manufacturers of parts of automobiles which you mention in effect compete with the parts manu-

factured for or by the automobile manufacturers themselves, members of your association?

Mr. CARLTON. Yes, sir; I think our largest competitor is our own customer. At least our potential competitor is always our own customer. There are some parts of automobiles that are not made at all by the manufacturers of automobiles and trucks. There are other parts that are made, some by one and some by the other.

I know that you will be interested in knowing what parts of automobiles are manufactured by the members of this association.

I am sorry that I have only two copies of this list available and I wouldn't attempt to read into the record a list of these parts, but I would like—

Mr. DAVIS (interposing). Mr. Chairman, may we have that inserted in the record without reading?

The CHAIRMAN. Without objection that will be done.

Mr. CARLTON. I was going to offer these as exhibits to be added into the record because the names of over 300 parts of automobiles that are manufactured by the members of this association are on that list.

The CHAIRMAN. Looking at the title of this exhibit which you have just handed for inclusion in the record, it reads "Parts of an automobile, excluding the body proper and automotive equipment." Do you care to qualify that title any further? I understand that you were giving us a list of parts which were made by parts manufacturers rather than by automobile manufacturers.

Mr. CARLTON. No. Many of those parts are made by the automobile manufacturer, Senator.

The CHAIRMAN. This, then, is merely a list of the various parts which go into the construction of the automobile.

Mr. CARLTON. But there isn't one part on that list that is not also made by a parts manufacturer. They may make a part of those things themselves, or one manufacturer may make none and the other one may make all, and it is all mixed up in that way.

(The list referred to was marked "Exhibit No. 214," and is included in the appendix on p. 1152.)

Mr. CARLTON. In giving these sales figures and talking about this industry I would have you know that rubber and rubber tires are not in this group, they belong to the rubber association. I would also have you know that bodies are not in here, they belong to the automobile manufacturers association.

Senator KING. Some of the parts manufactured by members of your association are likewise made by the automobile companies themselves?

Mr. CARLTON. That is right, very many of them.

I think you would be interested to know that we have recently made a survey to find out how much engineering, experimental work, experimental samples, research and development cost this industry, the members of this association, in the year 1937, and that figure amounted to more than \$20,000,000 in the year 1937. The tool and die expense of this industry in the year 1937 amounted to more than \$20,000,000. In other words, this industry in research, development, engineering, tools and dies spent more than \$40,000,000 in the year 1937.

The pay roll of the industry in 1937 was in excess of \$250,000,000.

Senator KING. You mean your association?

ROLE OF PATENTS IN IMPROVEMENT OF AUTOMOBILE PARTS

Mr. CARLTON. The members of this association only. It is probable that you are wondering why we spend so much money in experimental and development work. The parts manufacturer selling to the manufacturer of automobiles and trucks is a servant to his customer. The parts manufacturer must live by his wits. He can only be successful in holding his business so long as he can continue to improve his product. He must make his product better constantly, lighter if possible. His customer, the automobile manufacturer, may be able at any one given moment to make the product that he is buying from the parts manufacturer as cheap or as well, but he must be convinced that the parts manufacturer because of his specialization in one product; because of the fact that he has a large volume of business gathered from a large number of manufacturers of automobiles and trucks, because of those things he can make it cheaper and he can afford to specialize, he can afford to do all of this research, all of this experimentation. As long as the parts manufacturer maintains this position of research and experimentation constantly, then he has a successful business. The minute he lets down then he is going to lose his business, because, as I said before, his greatest potential competitor is his own customer.

The parts manufacturer, in my opinion, and I believe it is the unanimous opinion of our industry, could not afford to engage in this very large amount of development and experimental work without the protection afforded by the patent system.

Looking over the large number of parts manufactured by the industry, it is evident that practically all of the companies manufacturing those parts started because of patents. Speculative capital was attracted to these new parts industries when they were new, because investors were convinced that here was something that could be sold in a large volume to the automotive industry, and that they could secure protection long enough to secure the return of their capital and make a fair profit on it. So in the beginning of practically all of these various parts industries the patent was the nucleus around which they were built.

It is not unusual for a parts company to spend a half-million or even a million dollars, and well over that in many cases, in the development of a single new part or device. The patent affords the parts manufacturer the opportunity to get his initial development and tooling expense back before his competitors start copying his device. The parts manufacturer doesn't ask for a continuous monopoly, because experience has taught him that his industry changes so rapidly and competition is so intense and so fierce in the industry that nothing that he patents today is going to continue in the form in which he patents it. It would be foolish to insure speculative capital, for example, that if he puts his money into this given part in this industry, that for 17 years we are going to continue to make this part in this given form, because we know that we must progress and that competition is going to build something better, and therefore we must build something better or we will have no business in a very few years.

All we want is a hesitation period, a head start, as we used to say when we were boys, to give us a chance to get the experimental and developmental money back.

Senator KING. I suppose the mortality in your industry is very great?

Mr. CARLTON. It has been exceedingly great. It has settled down now to a much more stable business than it has been.

A patent granted to a competitor in this industry has proved to be the greatest incentive possible to other competitors. For example, if one of my competitors tomorrow should bring out a wheel which would revolutionize the wheel industry and threaten to put the company with which I am connected out of business, that in itself would be the greatest incentive in the world for us to use every possible means to get around that patent and to devise something quickly to save our very lives and our physical existence, and I am sure we would do it. We have been faced with that situation time after time. We have lived through the days when all wheels were wood, as you remember on your automobiles, where we had investments of several million dollars solely for wood.

Then you remember how we all switched to wire, and we switched to wire along with it. Then you saw the switch to steel and we switched to steel along with it. We obsoleted equipment and equipment and equipment, and we learned to do new things and to do them better, so I say that patents granted to somebody else are the greatest incentive to force the other fellow to do something new himself.

PATENTS INCENTIVE TO PRODUCTION OF NEW INVENTIONS

Mr. CARLTON. Patents, then, as I say, instead of becoming monopolies, become incentives to produce other inventions.

The CHAIRMAN. How many different ways are there of meeting the new competition which arises from such a patent? I am asking you now from your experience.

Mr. CARLTON. Well, I think those ways are endless. They have to be endless or you would give up.

The CHAIRMAN. What has been done. Could you give us one or two examples of just what has been done to meet a particular situation?

Mr. CARLTON. Well, a few years ago a new brake drum came on the market. You can remember only a few years ago, if you got seven or eight or ten thousand miles from a set of brake lining, and mentioning brake lining, I should have said that that also is not within this industry. There are a lot of sales; I should have said that the fabric upholstery in your automobile isn't in our sales either.

You can remember that if you got 10,000 miles on a set of brake lining without having your brakes relined at a considerable expense, that was something. Then along came cast-iron brake drums, and they were better. Then along came another type of drum.

A few years ago we brought out what we believed to be a real invention in brake drums. We were practically forced to bring that invention out. We had to have something better. We had to have it or we weren't going to hold our business. We were going to lose all of our brake drum business, and that is a terrific lot of business. Of course we had a nice replacement business in brake drums. That replacement business is gone now, because the drums last almost the life of your car. They do, today.

We spent over \$2,000,000 in the development and in highly specialized machinery which can't build anything else but this brake drum,

and in a building, the building cost only a little over \$300,000 to build that one item.

The CHAIRMAN. That is one method. That method I should describe as the invention of another and better device. Another method would be to purchase an outstanding patent.

Mr. CARLTON. Yes, sir.

The CHAIRMAN. Another method would be to license a new, an improved device.

Mr. CARLTON. Yes, sir.

The CHAIRMAN. You have followed all three of those proceedings, have you?

Mr. CARLTON. We have done all three of those.

Another method is to find a better method of manufacture, so you can manufacture more cheaply than the other fellow.

The CHAIRMAN. Do you have in this industry which you have described, in this association, a cross-licensing system?

Mr. CARLTON. Well, not in the association at all, as an association, because we are competitors in the wheel business; they are in the carburetor business; they are in all these lines of business. There are cross-licenses existing among groups of competitors.

The CHAIRMAN. All right. Now let us take the carburetor manufacturers, for example. Do they cross-license their devices?

Mr. CARLTON. I don't know about that. I know about the wheel business.

The CHAIRMAN. All right, let's ask about the wheel business.

Mr. CARLTON. All right.

The wheel business is an old industry. The company with which I am, and its predecessor company, started in 1903. The Motor Wheel Corporation owns over 500 patents. I asked our competitors how many they owned, and I know that they own well over 500 patents. We never sued anyone, with all the patents that we own, except once. A fellow got a little nasty and we sued him and we settled it out of court and we gave him a license, and they went out of business anyway.

If those people in that wheel industry, with those thousand patents, started suing each other, the management ought to be discharged, because they would ruin themselves financially. You take a thousand patents and start clubbing each other over the heads with them, all the people in the industry would be broke, so common sense dictated just one thing, to stop this monkey business of fighting each other, and I will give you a license and you give me a license, and we will stop any further law suits in this industry.

Those licenses are just simple cross-licenses, nonexclusive licenses, in which we license a competitor, but we retain the patents ourselves and the rights to license anyone else that we please, and he does the same thing.

Mr. PATTERSON. Mr. Carlton, does your association have any kind of an arbitration board where, once you see that some of these companies are about to go to war, you step in and try to help them?

Mr. CARLTON. No, we do not. There are groups within the association that get together and try to do that among themselves, but we have such a varied lot of different kinds of competitors, and they are so very independent, that each fellow wants to be independent and he doesn't want any association or anybody else to tell him anything.

LICENSING OF PATENTS

The CHAIRMAN. Well, now, these licenses are nonexclusive. Do they carry any restrictions of any kind?

Mr. CARLTON. No restrictions of any kind.

The CHAIRMAN. They are open licenses?

Mr. CARLTON. Wide open, nonexclusive licenses.

The CHAIRMAN. What provision is included in the license by way of consideration for the granting of the license?

Mr. CARLTON. No royalty.

The CHAIRMAN. No royalty? Then what do you receive by way of consideration for the granting of the license?

Mr. CARLTON. A license from the other fellow.

The CHAIRMAN. It is merely an exchange of licenses with the other fellow.

Mr. PATTERSON. A quid pro quo.

Mr. CARLTON. Exactly.

The CHAIRMAN. So that every license from the Motor Wheel within this association is available to all the competitors on equal terms, nonexclusive, without restrictions, absolutely open and no royalties.

Mr. CARLTON. That pertains only to passenger car wheels. When you get into truck wheels, it is a very varied industry.

The CHAIRMAN. With respect to passenger car wheels, have I stated it correctly?

Mr. CARLTON. Yes, sir.

The CHAIRMAN. With respect to the other types of wheels, what is the difference?

Mr. CARLTON. With respect to the truck industry, that is a varied thing—cast-iron wheels, and so on.

The CHAIRMAN. What you mean to tell us is that in that industry you do not grant these nonexclusive, open licenses.

Mr. CARLTON. In that industry, when it comes to a demountable pressed steel wheel, so far as I know, the same people that make passenger-car wheels are making those wheels, and those people are cross-licensing the same as they are on passenger-car wheels, but when you get into all these other types of wheels I know very little about them. We know very little about them; we don't make them.

The CHAIRMAN. When you made that qualification it was only because you didn't know what the facts were, and not because you knew it was different from this other phase?

Mr. CARLTON. That's right.

The CHAIRMAN. Thank you very much.

Mr. CARLTON. I would like to finish the story of this brake drum thing because I know it is very interesting.

Having spent this \$2,000,000, we couldn't go ahead with the thing until we got this patent through, because we couldn't venture \$2,000,000 to build an article which is selling for approximately 60 cents, and that 60-cent price is competitive with another article which our competitors are building—it is different, but it accomplishes about about the same thing, so if you are going to sell an article for 60 cents and spend \$2,000,000 to develop it, you have to have some protection there to be sure the other fellow isn't going to step in and take it away from you before you get your \$2,000,000 back and a little profit on the \$2,000,000 if you can get it.

The CHAIRMAN. Now with respect to the manner in which you use this patent or the manner in which you grant these licenses, I should have said, do you grant them to any applicant?

Mr. CARLTON. You are now talking about this cross-licensing on wheels?

The CHAIRMAN. Yes; your licenses on wheel patents.

Mr. CARLTON. It just happens that in this passenger-car wheel business there are only 3 manufacturers that have survived. I can remember within my time in the industry when there were 18, and they have fallen by the wayside financially until there are 3 left, and I have explained the situation within those 3, and that is all there are.

The CHAIRMAN. Now suppose that another group were to form a new corporation to engage in the manufacture of motor wheels in competition with you. Would you freely grant a license to such a new group?

Mr. CARLTON. I will now speak for my company only. There is no agreement between the 3 people as to what they would do. A licenses B, B licenses C, and each fellow acts as an individual, but within this industry, where these three people are today, we are terribly overtooled and overbuilt or have over-production. We have a capacity to build more than 5,000,000 sets of this material, and in 1939 we are looking forward to maybe a 3½ million car year.

Now I am very positive that our company wouldn't license another fellow to get into this business when there is an overproduction. Why allow another fellow to get in? We would do everything we could to keep him from getting in with all the patents we had, and my guess is the other fellows would act about the same way with their patents.

The CHAIRMAN. Of course you would be entitled to do that, because a patent is an exclusive right; but I was curious to know whether there was any understanding in the cross-licensing system by which you would exclude any but those who were in the system for using or receiving a license?

Mr. CARLTON. There is no understanding to that effect.

Mr. DAVIS. Mr. Carlton, you spoke of there being within your recollection 18 manufacturers of these car wheels, and that that number has been reduced to 3. How many of those 18, if any, were merged with or acquired by one of the 3 remaining companies?

Mr. CARLTON. Several of them were. For example, I think, Judge, you remember that the Motor Wheel Corporation purchased the physical assets of two of these companies because we were sued and we bought ourselves out of difficulty.

In the beginning of the steel-wheel situation in 1923 we got into trouble. We started the manufacture and we thought we developed something, and one of these companies sued us and we took a license and were paying a very high rate of royalty. Then another company sued us, and then that company sued the one we were paying royalty to, and neither one of them had any business, had no customers to amount to anything. Each of them had about one customer, and they had a very small volume of business, and financially they were both broke, and so they were suing us for a livelihood.

The Motor Wheel Corporation, since 1920, has spent over \$2,000,000 in patents. Now, we acquired those patents by buying the physical

assets of those two companies and also buying some other patents directly, but we didn't acquire anything when we acquired the companies. I know one company, the net liquidated amount we got out of it was \$72,000. That is what we had in physical what-have-you that we got, but we did get the patents, and we bought ourselves out of a lawsuit and out of trouble.

From the other company we got some patents, oh, several hundred, and I would hate to pick one patent out of them and say it was very good, but there were so many of them that they scared you to death.

Now, to answer the rest of your question, another company purchased at least one—at least one other company was purchased by one of our competitors, and the rest of them went out of business because of financial difficulties.

A large number of those, Judge, went out of business when the wood wheel went out of business. When the wood wheel vanished they were tooled to make nothing but wood wheels, and when they no longer could convince the public to wear that kind of bonnet—and that is about what it is, the public is changeable about the way wheels look about the way women are with their hats—they couldn't afford to tool up to go into wire wheels.

Incidentally, there was a serious patent on wire wheels, and we took a license under that and paid very high royalties for some length of time.

Some of them just folded up and liquidated and went out of business. More of them did that than failed. They quit. Some of them died of old age; some of them died of stagnation, because they couldn't keep up with the parade.

That is about what happened to the rest of these fellows, until it got down to three who are in pretty good shape today to stand the battle.

The CHAIRMAN. That was before the stabilization of which you spoke a little bit earlier?

Mr. CARLTON. Yes.

The CHAIRMAN. Now, under the present understanding, what is the position of future patents?

Mr. CARLTON. There are a large number of these licenses. There is no agreement among these three companies that says we will give you a license under everything we have. It started back in wood-wheel days, when we got into an awful jam about rims, and we got sued by an outsider, as we call him, and then we bought his patents.

You would be surprised; we paid \$750,000 for some patents just on a rim that goes on wheels. Then we licensed everybody that wanted to be licensed, everybody who wanted a license on rims, and we gave him a paid-up license without any royalty.

Then it went into wire wheels, and then it went into brake drums, and then it went into the processes of manufacturing. I don't know how many of these licenses there are, but they have accumulated, but each one of them is an individual license from me to you in return for a license on the same thing from you to me, without any restrictions whatsoever or any conditions or any royalties.

The CHAIRMAN. In other words, you don't have a general cross-licensing agreement.

Mr. CARLTON. No.

The CHAIRMAN. It is merely an understanding.

Mr. CARLTON. Then in some of these licenses there is this provision about new patents, which says that "The license gives you everything that I now have and all that I shall in the future invent for 15 years, but if at any time I make what I consider an outstanding invention, that I feel is revolutionary, and I don't want to give it to you, I shall then notify you of that invention and it is then my privilege to withdraw it from the cross-licensing agreement."

Mr. DIENNER. Mr. Carlton, at this point you might well tell us the effect upon the quoting of prices by a competitor. Assume that he had a license which he got through compulsion or otherwise, not intending actually to use it. What would be the effect of that?

Mr. CARLTON. Well, Mr. Dienner, that has been a wicked practice in this industry. I have known people within this industry who were so anxious to be free and easy with their patents that competitors have come to them and said, "I sort of like that thing you make; I would like a license under it." They agree upon one and agree upon a royalty, and this has actually happened: The competitor who got the license didn't want to manufacture it. It costs a lot to tool up to make it. He had a device which he was selling. What he wanted to do was to quote on the other fellow's product. Having got the license, he quoted a low price, a lower price than the article should be sold at, and he made a monkey of the other fellow's product and boosted his own product.

In one case he got some business and he couldn't manufacture it and he couldn't deliver. Then he asked for time to tool up. At the end of the year the original fellow got the business back.

There is great danger in a free idea of just handing the other fellow a license unless you know he is going to use it. Of course that could be stopped by a very high minimum royalty which would be so high that he couldn't afford to pay it unless he was serious and was going into the manufacturing business, but in this industry, wherever there are licenses granted, the rate of royalty has been very low, because if you are going to stay in business in this industry your profit area is very small. The profit area in this original equipment business you can easily determine by looking at those companies that are listed upon the national exchanges. In 1937 you will find they ran as low as 2 percent, and, I think, none of them higher than 10 percent. Does that answer your question, Mr. Dienner?

Mr. DIENNER. One more point. Assume that there were a system of compulsory licenses, how would that operate on this quoting practice?

Mr. CARLTON. What is that?

Mr. DIENNER. Assume that there were a system of compulsory licenses, namely, that another competitor could come to you and demand a license, what would be the effect of such compulsory license law or provision on this practice of quoting?

Mr. CARLTON. Well, it would be just the effect that I now mention. It would be ruin to the fellow's business if it got in the hands of a vicious competitor.

Senator KING. Mr. Dienner, I haven't heard the suggestion made, and perhaps it is because of my lack of information or inquiry, that there should be compulsory license for patents which are being used. The suggestions which I have heard made were that if a patent was not used, within a reasonable length of time, and there was no evidence

that the patentee intended to use it, then application might be made to the court under proper restrictions, to license the patent.

The CHAIRMAN. Senator King, I merely wanted to bring out practically the full picture of where the compulsory license certainly should not extend.

Senator KING. May I ask one question, hardly pertinent to what has been stated. I assume from what you have said, however, that with all of these changes, this mortality that has occurred, there has been a general improvement in the products which have been manufactured by your association as well as by organizations not within your association.

Mr. CARLTON. Yes, sir; Senator, and to my very best knowledge and belief, there is not one part of an automobile manufactured and sold today by a parts company which is not better from every standpoint than ever before, and which is not being sold to the manufacturer of automobiles and trucks at a lower price today than it has ever before sold in the history of the industry. A wheel, for example, today, is being sold for 20 percent less than a wheel for the same car was sold 5 years ago.

Senator KING. In view of the small profit you have indicated, from 2 to 10 percent, and the great mortality, I marvel that there should be capital available for the automotive industry, especially the parts. People must have a good deal of the gambling spirit, it would seem to me, to invest in an enterprise, in an industry, where the mortality was so great.

Mr. CARLTON. That is true, Senator, and it is true that very few new companies are coming up in the parts industry today. It is very rare that a new company starts. On the other hand, we deal in terrific volume of business, and once a company is started and acquires that volume, a percentage of net return at the end of the year of 5 percent will net the investor a very fair return, and parts companies have made a fair return on their money over a period of years.

Senator KING. That is, some companies.

Mr. CARLTON. Yes.

The CHAIRMAN. The survivors.

Dr. DIENNER. Mr. Carlton, you have mentioned the fact that parts now sold are generally of better character and lower price than they have ever been. How is that possible? How are you able to do that?

Mr. CARLTON. You are able to do that by better manufacturing methods, and particularly by constantly improving your product so that it is more easy to manufacture. For instance, a wheel today is manufactured on machines that produce greater quantities of wheels in an hour, and that wheel can be produced of material which can be purchased at lower cost than formerly. The wheel is just a type of wheel which can be made lighter than ever before.

Mr. DIENNER. Do you think that patents had anything to do with this situation?

Mr. CARLTON. They had a very great deal to do with the situation. The development has been constant and everlasting, and the improvement patents are the protection that we have, and without those continuing improvement patents, our customers and those people that look upon our industry and see us make money in 1 year might step in and take our business away from us.

Labor rates have increased constantly in this industry until we have a situation today that seems very unusual, in that the wage rates

paid the factory workers today in this industry I am very safe in saying are 20 percent higher today than they were in 1936.

That means that wage rates today are higher than ever before in the history of this industry, and still our product is being sold at lower prices than ever before in the history of this industry.

Representative REECE. May I ask, Mr. Chairman, what percentage of the business of your industry is with the motor manufacturers?

Mr. CARLTON. I have that figure in the very beginning; as I remember, it is 83 and a fraction percent of the business of this association that is directly with the manufacturer.

Representative REECE. And one other thing. Are all of the more important parts patented devices?

Mr. CARLTON. All of the parts are patented. I wouldn't say that there are fundamental patents covering all of them, but there are improvement patents, hundreds of them, covering every part, and it is upon those improvement patents and many fundamental patents that this industry relies.

Mr. DIENNER. Right at that point, Mr. Carlton, is there any patent, fundamental patent, on any part which is supplied on an automobile which would prevent somebody from supplying that part either in one form or another, to your knowledge?

Mr. CARLTON. That is a very interesting question. I have looked into that very thoroughly, Mr. Dienner, and I find that there is no one part of an automobile all forms of which are covered by a single patent or by a group of patents so that any one company has a monopoly on that one article. Now that means, saying it the other way, that a purchasing agent of an automobile company has competition today offered him on every single part that he wants to buy. He may want to buy a Carter carburetor; and that is protected, but he can buy a half dozen other kinds of carburetors. That is the way it goes down the line. He doesn't have to buy that one kind of a carburetor, so that there is competition for every one of these various items, and that is really a very healthy situation all down the line.

The CHAIRMAN. Would it be proper in your opinion to draw as a conclusion that the effect of the patent system when it is not diverted by means of closed patent pools is to maintain competition?

Mr. CARLTON. Yes, sir; very decidedly so.

EFFECT OF ABOLITION OF PATENT SYSTEM ON COMPETITION

The CHAIRMAN. And would it be proper in your opinion to say that if the patent system were abandoned or were abolished, the effect upon competition would likely be bad?

Mr. CARLTON. Very bad, and result in a lessening of incentive; it might result in some stagnation.

I would like also just to mention one other phase that has come up so many times in this association. Patents are valued so much more by the small manufacturer than they are by the large manufacturer. The large manufacturer has built himself a terrific volume and by that volume possibly he is able to buy materials cheaper, he is able to set up one continuous line and he can run that one item without end, he may be able to set up a machine that will run it a year without ever changing his dies. Die changes are very, very expensive on these complicated dies. And he has that great advantage over the

small fellow, who has a very small amount of business here and there. Now the advantage that the small fellow has is a trick method of manufacture that the big fellow doesn't know about or that he can't afford to put in, or he has a patent on some little device that he can make a fine little living on. I have been surprised at the small manufacturers of this industry who employ 10, 20, 30, 40 men, and how well they do and how at the end of the year their percentage of profit is better, way higher, than the fellow who does business in millions, and so I thank that if anything happened to this patent system the fellow who would be hurt more than anyone else would be the smaller manufacturer. The bigger man gets his volume, and the more volume that he has accumulated and the more volume he is assured of the less he values the whole patent system, in my experience. At least I am sure that is true of this industry; I wouldn't want to translate that into any other industry except this one with which I am so familiar.

Mr. DIENNER. Mr. Carlton, one more important point I think you ought to cover. Do you know of any instance in your industry where a patent improvement has been deliberately withheld from the public or shelved in order to prevent its use?

Mr. CARLTON. No; I have never heard of anything of the kind. At a recent meeting of a large number of the members of this industry somebody brought that question up and they were all on their feet at once and everyone said, "Well, we have got over-capacity, we are looking for new things to make. If any of you have got a patent, and you are trying to hold it back, will you give us an opportunity to buy it or take a license under it and tell us what it is?" I don't believe there is anything like that in our industry. I am sure that there isn't.

PATENTS NOT USED TO ESTABLISH MONOPOLY

Mr. CARLTON. I would also like again to bring out that no one in this industry tries to establish a monopoly because of a patent. That works about this way: We realize that no one parts manufacturer can get all the business in the world. Therefore, we must recognize our competitors in the business. We realize also that all of the large manufacturers of automobiles are not going to confine themselves to one source of supply. They won't do that because of strikes and fires and all the other things that go into that, and therefore if we had a patented article that they wanted to buy and we wouldn't give anyone a license, that article would never go on the market in a big way. We realize that. We have found that out by experience. So common practice with us—and it is common practice with a lot of other people making other things than we make—is to try to get ourselves some business from these large manufacturers and then say, "We know that you won't give us all this business and we don't want it all. Give us a part of your business and we will give you a license to make or have made." So all we want is protection to get ourselves some business and get our development expense and so forth out of the thing.

I think I am about through. I had a little philosophy of my theory of this thing.

Mr. PEOPLES. Mr. Chairman, before Mr. Carlton gets down to his summary, I would appreciate very much, by reason of his intimacy with the trade in general, if when you come to the marketing practices

of your corporation, you would say, Do you establish list prices for the guidance of the different dealers and the sale of spares to the public?

Mr. CARLTON. I am glad you asked that.

Mr. PEOPLES. And also what effect that list may have on the list prices of your competitors.

Mr. CARLTON. First of all, practically all of my discussion so far has been directed to the original equipment business, that is, stuff sold to the manufacturer of automobiles. In my company our automotive sales are 90-odd, 96 or 97 percent of all of our volume. We sell nothing to the consumer, nothing to dealers, except service parts. Your question is directed to those people who sell replacement parts and accessories. The practice of those people selling replacement parts and accessories is almost universally to sell an accessory at a net price to the distributor. They don't sell to dealers—some of them do, some sell to dealers—the great majority is sold to the distributor; the majority of them, not all of them but the majority, sell to that distributor at a net price. They may have a recommended list price, resale price, but that varies all around the United States. I know of no attempt in this industry to try to maintain the resale price, if that is what you mean, a list price or a resale price. There are companies that follow the other practice of a list with a discount from list.

Now they do that—we do that in some instances on a wheel; where a service station wants to handle a wheel out of New York City we go to our customer and find out what his prices are on wheels in order that we may sell to the Packard dealer in New York City—we don't sell the consumer at all. We want to be able to have our distributor in New York City sell to that Packard dealer at the same identical price that Packard can sell to the Packard dealer. We prefer in the beginning that Packard sell that dealer all of his service parts, but Packard says to us, possibly not Packard, but I am using that only as an example, "Over a period of 10 or 20 years we have changed wheels and sizes and types until any one dealer just can't have all these wheels so that if you break a wheel, have an accident, and you come in and pick one of those out of stock, you just can't do it." So there has grown up in this country wheel service stations who specialize in carrying wheels back 20 years, where that dealer can pull that wheel out of stock if it is 20 years old. That dealer wants to buy that wheel at the same price he would if he would wait 4 or 5 days and get it from the factory, so there is a list price, not a list price but a net price to our dealer so that he can sell the car dealer at the same price as though he got it from his own factory.

Mr. PEOPLES. And your competitors follow the same practice?

Mr. CARLTON. Yes; in the wheel business.

Mr. PEOPLES. Then the prices, when it comes to the ultimate purchaser, may be essentially the same.

Mr. CARLTON. Probably about the same.

Mr. PEOPLES. The same over a period of time, 2 months, 3 months, 6 months?

Mr. CARLTON. Yes; and those prices, for example on a wheel on a car that you want this year, are lower than on a car 10 years old.

Mr. PEOPLES. Exactly so.

Mr. CARLTON. Because it costs a lot of money to carry that thing around for 10 years, but that fellow may be glad to get rid of it, he might sell it at any old price. We don't try to maintain those prices.

Senator KING. The prices would differ, I imagine, based upon your freight rates. You would sell to some person in Omaha or San Francisco—

Mr. CARLTON (interposing). That is right, very materially.

Senator KING (continuing). Where the freight rate would be much greater than if you sold in New York City at a price entirely different.

Mr. CARLTON. Yes; and again I want you to understand that we don't sell the retailer, the car owner, anything under any conditions.

Mr. PEOPLES. I was trying to arrive at the practice.

Mr. CARLTON. Neither do we maintain any retail prices.

The CHAIRMAN. You don't maintain a standard price throughout the country?

Mr. CARLTON. No, sir.

Representative WILLIAMS. Do the dealers?

Mr. CARLTON. Not throughout the country.

Mr. PEOPLES. They do it by regions?

Mr. CARLTON. Oh, they set their own price. The man on the Pacific coast figures what he can get out there and adds whatever the freight is and sets any kind of price he wants to set.

Mr. PEOPLES. Does any leading dealer in the industry, say, fix the price through a list price which is followed by his competitors in a given region or zone or geographical area?

Mr. CARLTON. Not in our industry. Not in my business. I am not talking of the industry because I am not familiar with all that retail thing.

Mr. DAVIS. Mr. Carlton, I didn't catch the exact name of the association of which you are president, the large association.

Mr. CARLTON. It is Automotive Parts & Equipment Manufacturers, Inc. Now it is commonly called the Automotive Parts & Equipment Manufacturers Association.

Mr. DAVIS. That is an incorporated association?

Mr. CARLTON. Yes, sir.

Mr. DAVIS. Is stock owned in it, issued and owned by the different members thereof?

Mr. CARLTON. No. It is a nonprofit corporation.

Mr. DAVIS. How many members has your association?

Mr. CARLTON. 375 at the present time.

Mr. DAVIS. As I understand, that is made up of the manufacturers of most of the parts, some of which are not related to or in competition with other parts. For instance, there is no relation or competition between a car wheel and a speedometer.

Mr. CARLTON. That is right.

Mr. DAVIS. Just what function generally is performed by this association of people manufacturing different parts which do not have any relation to each other except that they are parts of an automobile?

Mr. CARLTON. First of all, every 4 weeks every member of this association reports the number of men on his pay roll, the number of women, his pay roll, his actual wage rates, his productive and non-productive labor, the number of salaried people, his total salaried pay roll. Once a year he reports his sales volume broken down into all of the various classifications of our industry. Our industry (I haven't gone into detail) is broken down into a lot of classifications. Then there is available for any member of the industry—if a labor union comes and says, "You are not paying the right wages," they can call

upon us at any time and we can furnish them not any individual rates, we don't furnish the individual wage of any competitor, that is secret information, but we can furnish them the average wage being paid by all of his competitors, or we classify those by cities and by all of the various classifications of jobs in cities; we have big job sheets by which we classify wages by jobs in a city. We have one for Toledo, one for Chicago, and Detroit, every city in which we operate, so that a man has that sheet and he can look at that at any time and find out whether or not he is in line with the other fellow, whether he is up to the other fellow, whether he is liable to get in trouble because he isn't up to the other fellow. It isn't any attempt to hold wages down, it is an attempt to be sure that he keeps out of trouble. Those sheets are even made available to some of these customers of ours. He has a source of supply and he hears of trouble and he calls us up and says, "How does that fellow check up in his home town?"

We say, "Well, he is a little bit low." He calls him in and says, "Hey! What are you paying in your home town? What wages are you paying?" If he is too low he tells him so. That is a healthy situation in an industry.

In addition to that—pardon me.

Mr. DAVIS. Are the wages uniform, we will say, in the same city or same area whether they are working on car wheels or speedometers or shield wipers or any other parts? Are they all uniform?

Mr. CARLTON. Oh, no; they do vary somewhat, Judge, by industry. In other words, a man doing a very heavy type of work may get a little different rate, but in a given group if a man is making leaf springs in the city of Detroit, the chances are that the wages for leaf springs are all about the same. The union takes care of that pretty well. It is a pretty thoroughly unionized industry, especially in cities, not in the smaller towns, and if the union came to you and said, "We want an increase and you are not paying as much as your competitors," you wouldn't know, you wouldn't have to call your competitor, you could call the association and it would tell you exactly where you stand with the other people in town, Mr. A, B, C, D; you wouldn't know who they were, but you would have them all.

In addition to that we have a labor-relations department that is advising them on all matters of labor difficulties in order to keep peace in the industry. It is very active in that matter. It is a very necessary thing. If one of these parts plants closes it is a very serious situation; it stops the automobile plant immediately. They carry very, very small inventories. The inventory is in the parts plant, in the plant of the parts company, and in transit to a large extent; there is some on hand there; and it can't be closed without closing the automobile company and causing a terrific lay-off in all other industries. So they are working very carefully with a considerable cooperation with the union at the present time.

The CHAIRMAN. Where do most of your patents come from? I mean where do the ideas come from? From within your organization or from outsiders?

Mr. CARLTON. Speaking first of all of my own company, the majority of our patents have come from within our own organization, from our own development, although we have bought a large number of patents from the outside. We are buying from time to time patents that come to us from the outside.

The CHAIRMAN. What would you say is the opportunity for the unattached inventor to dispose of a useful patent in this industry?

Mr. CARLTON. I think it is very, very great. I know that in every branch of this industry there is a constant procession of purchases of patents going on all of the time.

The CHAIRMAN. You said earlier in your testimony that your industry has reached that degree of stabilization in which the members have abandoned litigation among themselves with respect to patents.

Mr. CARLTON. That isn't true of the whole industry. There is litigation going on among members of this association, not in the wheel industry there isn't, but among other people.

The CHAIRMAN. You mean among members of the association?

Mr. CARLTON. Oh, yes.

The CHAIRMAN. So that that has not been completely eliminated?

Mr. CARLTON. Oh, no.

The CHAIRMAN. How about litigation between members of the industry, manufacturers, and these unattached inventors? Is there much of that?

Mr. CARLTON. There is plenty of that going on all the time, sir.

The CHAIRMAN. Your associates or companies have been defendants in infringement suits, have they?

Mr. CARLTON. Many times.

The CHAIRMAN. The reason I am asking the question is the complaint is frequently made to Members of Congress, I know it has been made to me many times, on the part of inventors that their devices have been pirated by manufacturers who just put them to their remedy in the courts and when they are unable to finance a lawsuit they are unable to protect themselves. A case was described to me only yesterday after the conclusion of the testimony here, by a woman who was seated in the audience who came to my office later on, to say that her husband had invented a certain device and a patent had been issued, that this device was being used by a large business concern, that she went to a lawyer, the lawyer originally said it was a good case and he would take it, but that he afterward withdrew from the case; she had no money, her husband had no money, there was no possibility of her paying the lawyer's fee.

I wonder what out of your experience you would care to say to this committee with respect to the chances of an independent, unattached inventor to protect himself under the present patent system from the use of his device by a well-established concern, fortified with money and lawyers, and so forth.

Mr. CARLTON. First of all, I think, in fact I know, that the people in this entire industry are basically very honest.

The CHAIRMAN. I believe that is true of most industries, too.

Mr. CARLTON. They have found that it pays to be very honest. They have gotten in more trouble by trying the other thing, and it is just financially good business, and therefore every improvement or so-called invention—

The CHAIRMAN (interposing). Are we to infer that the other thing has been tried?

Mr. CARLTON. I think it has; yes. Every improvement or so-called invention is put into this patent office in order that we may protect ourselves. Secondly, we have never put anything into production without the most careful and thorough search to be sure that

we are not infringing something else. It is easier to do it that way than to have the fellow jump on you after you get into production.

When we find there is something that we might infringe, we contact that patentee and we try to get a license. In practically every case we are satisfied with a nonexclusive license, or if he wants to sell the patent for a reasonable amount we might buy the patent. Now where the manufacturer gets in difficulty, my experience has been in 25 years that practically every time we have gotten in trouble is where we have unknowingly and unwittingly infringed a patent, or where we have gotten into production and then after we have gotten into production and gone along for a number of years, a patent has popped out of the Office that we didn't know was here. Then we are in difficulty.

In those cases sometimes we settle, sometimes we take a license and pay royalties, sometimes our attorneys advise us that we don't infringe and it goes to suit, and we lose, and we pay what we have to pay.

I know of no cases of an inventor who has been unable to finance a lawsuit. There seems to be about the same degree of overproduction of patent lawyers as there is of wheel production, and there seem to be plenty of them that are willing to take these cases and take their chance on what comes out of the case. I know that we have been prosecuted, and maybe persecuted, in cases by lawyers who took the thing on a contingent basis, and I think your friend was unfortunate that she didn't contact the right man.

The CHAIRMAN. Your judgment, out of your experience, is that the unattached inventor has an opportunity to exploit his device under the present system.

Mr. CARLTON. I certainly think so; yes.

The CHAIRMAN. And do you want us to understand that out of your experience you believe that manufacturers as a practice do not attempt to pirate devices without proper compensation?

Mr. CARLTON. No, sir; they do not in this industry.

The CHAIRMAN. I was interested in your discussion at the outset of your testimony of the relationship between the members of your industry and the automobile manufacturer. You spoke of sort of a competitor-customer relationship. Can you go into that a little further? Tell us something about the effect, if any, which the automobile manufacturer exercises or exerts upon members of your association.

Mr. CARLTON. That effect is probably a very excellent incentive. That effect keeps the parts manufacturer on his toes because the automobile manufacturer is going to buy the best product that he can buy and he is going to buy that product at a price which he thinks is very fair. There are all sorts of variations of this thing, but we might take this example. A manufacturer might make a part of a given automobile device himself in his own factory. Making that device, he keeps very careful check of his cost, and therefore he determines about what he is going to pay for that device, and he has a club over the parts manufacturer's head.

I think he has been fair about it. He knows if he doesn't allow the parts manufacturer a profit, he won't be in business and he will lose his source of supply. But he isn't going to allow him an exorbitant profit. On the other hand, another manufacturer may buy

all of that piece that he uses of the parts manufacturer, and he will continue to do that as long as he thinks that parts manufacturer is alive, that he has an engineering force that is bringing him constantly new ideas, that he is improving his product, that his prices are never going up, that they are going down, and that he is really his research and development and engineering department for that one specific part.

Now when you can get yourself to the point where they look upon you as being smart as engineers, and where they will say, "Well, we won't try to design this wheel, we will just leave that to you, this is the kind of body we are going to have this year, now come on in and help us design a wheel," when you get a design they look at it and help you, and when you get all through they say, "All right, build some samples," and we build the samples and we change and we change and we change, and we work and get the weights, and so forth, we know how much the car is going to weigh, we test in our laboratory for strength, and so forth.

The CHAIRMAN. Is that done before or after you have made the contract for delivery?

Mr. CARLTON. That is before the model is ever brought out.

The CHAIRMAN. So this experimental expense is borne by the manufacturer of the part?

Mr. CARLTON. Yes; and when you get that done you may have spent \$25,000 in just this one little job, to do that job, and when you get through they call your competitors in and say, "Boys, here is what we are going to do this year and here is the blueprint of it," and the other fellows come in and bid on your work and you may lose the business.

I never saw an industry, I don't believe there is an industry which believes in free and unrestricted competition to the point of coming nigh to assassination the way this industry does. They seem to enjoy it and thrive on it.

The CHAIRMAN. No effort is made then among the members of the association to prevent one another from underbidding on a case such as you have just now described?

Mr. CARLTON. Oh, I should say not, and the large manufacturer wouldn't give us all of his business. He will have another competitor in there. On one model he will have our part and the other fellow's part on another one, and get the wheels as close together as he can, and there you are.

The CHAIRMAN. Maybe that is the reason there are, as you call it, in the industry, bugs in one car and not in another.

Mr. CARLTON (laughing). I wouldn't answer that. You see, we are trained in the sales school where we were taught years ago that the customer is always right, and therefore we never criticize anything that he does, we just try to make a living.

I would like to close with just this statement—

EFFECT OF PATENT SYSTEM IN INCREASING EMPLOYMENT¹

The CHAIRMAN (interposing). I was going to ask you just another question before you get into your philosophy—I think that was the word you used. What in your opinion is the effect of the patent system as you have experienced it, upon unemployment?

¹ For additional testimony on the relation of patents to employment, see *supra*, p. 857 et seq., p. 897 et seq., p. 904 et seq., and p. 932 et seq.

Mr. CARLTON. The patent system has certainly increased employment: New devices have made automobiles, the sale of automobiles, possible. The original equipment manufacturer can't create any business himself. We sign a contract for the year's requirements of a given model, an automobile, and then we have to sit and hope that that car sells. We are proud of the part we have had in designing that one part, and if all of the parts fellows together, plus the efforts, the very great efforts, of the automobile manufacturer, have made that car a success, then that car has the call that year.

I think the patent system, which I like to call a part of the American incentive system, has been the greatest factor in creating this great automobile that we have today which is being sold at the lowest price ever known before in the history of this country.

Does that answer your question, sir?

The CHAIRMAN. Do you have any suggestion to the committee as to any change that might be made in the patent system that would have the effect of increasing the opportunities for employment even more?

Mr. CARLTON. I think I have no specific recommendations. Of course, I am not a patent lawyer. I think I should receive some sort of degree, probably an "employer of patent lawyers." I have spent fortunes for companies employing patent lawyers, and so I check them up, I know what they do and I follow them up and I know what they spend and what happens, and I do know that over the 25 years that I have watched this Office—it is about 27 years that I have been intimately familiar with what the lawyers that I have been employing have been doing—there has been a constant improvement in things generally in the industry with which I have been connected, and it has always been this one industry, some branch of it.

What we want of course is better patents, with more assurance of their validity. What we want is faster action, and still the assurance that those patents are valid. I rather think I favor the 20-year limitation, although I can see some cases where that might work a hardship upon an inventor. We purchased a patent not long ago that had been in this Office a long time. I don't know why it was here so long but the inventor swore he didn't hold it here. It had been here 7 years, I think, when we purchased it. But it got into a very bad interference, and those things get very costly. It went clear through the Court of Customs and Patent Appeals, and so forth.

I have no very definite recommendations; only just those recommendations that patent lawyers and this Patent Department know will improve the Department generally. Certainly I don't want any fundamental changes in this patent system that I believe has been the greatest incentive that has made America what it is today in many respects.

The CHAIRMAN. Thank you, sir.

PATENT SYSTEM RESPONSIBLE FOR DEVELOPMENT OF AUTOMOTIVE INDUSTRY

Senator KING. As I understand you, the automobile industry by and large, including trucks and all, has largely been developed through the patent system. At any rate, the patent system has encouraged this great development in the automotive industry that we witness in the United States.

MR. CARLTON. It has in the parts industry. I am sticking to my story in the parts industry, Senator.

Senator KING. And would you say that the patent system by reason of the security which it affords has encouraged a larger expenditure of capital in the development of industries?

MR. CARLTON. It certainly has in the parts industry, very decidedly so.

Senator KING. And has that development increased the amount of employment, the number of employees?

MR. CARLTON. It has, because it has increased the sale of the items.

Senator KING. In your association are more persons employed now than there were 2 years ago, 3 years ago, 5 years ago, 10 years ago—at any prior period?

MR. CARLTON. Of course now is a bad time to measure that. We are picking up very rapidly. We have been through a year in which we were off 40 percent in the last year, but taking 1937, I believe it is a true statement—and Dr. Lubin can check me on this; he and I have had some correspondence about the employment in this country—to say that in the automotive parts manufacturing industry that we employed as many men as were ever employed at the peak of the industry, which was probably 1928 and '29, and the number of automobiles built was very much smaller, of course.

Senator KING. Are you paying a higher wage now than you paid in 1927, '28, and '29?

MR. CARLTON. Oh, very much higher. If you said 40 percent higher, you would be very low.

The CHAIRMAN. Do you require a high degree of skill among your workers?

MR. CARLTON. I wouldn't say a high degree of skill. In the business with which I am connected you can take a good farm mechanic—and I mention a farm mechanic because a good farmer is a swell laboring man in a shop—and in 60 days you can teach him practically any operation there is in our factory and he becomes an expert working man, with the exception of the tool and die industry, which of course requires an apprenticeship and a good many years of training. I am talking about the production lines.

The CHAIRMAN. But you do employ these tool and die workers also?

MR. CARLTON. Oh, yes.

The CHAIRMAN. What stability of employment do you give the latter type of worker, generally speaking, in the industry?

MR. CARLTON. The tool and die man? A very high degree of stability. We work very hard on that job because in the small town where we live we can't lose those men. Once having trained them to do our particular job—and they are very high paid men, they earn better than \$2,400 in a year—we can't lose those men, we can't let them get away from us.

The CHAIRMAN. What do you do to keep them?

MR. CARLTON. We do everything we can to keep them, by spreading our dies any way we can, and when we can't do that we transfer them to any other kind of job we have in the plant to hold them.

The CHAIRMAN. When your work falls off and there is actually not enough work in the plant to go around, do you attempt to keep these people on the pay roll?

Mr. CARLTON. Yes, we haven't lost them. We have about 100 of them that we have kept for many, many years, and as I say, those men will average better than \$2,400 a year.

The CHAIRMAN. And what about the less skilled employee, what stability of employment do you offer him?

Mr. CARLTON. Well, it is not as good as it ought to be. It is getting better.

The CHAIRMAN. In what way is it getting better?

Mr. CARLTON. We are the victims of circumstances, as are the manufacturers of automobiles. You can't convince people to buy automobiles in Northern Michigan when the snow is right now, as I understand it, over 3 feet deep just north of us. Consequently, the dealers can't afford the inventory and nobody has a place to put them, and therefore production slumps off in that time of the year.

The automobile manufacturer has done everything within his power, I am positive, to assist this situation. He formerly used to give us very sudden orders to do this and that and he doesn't do that any more. He gives us a contract for a year's business, and that isn't anything that you can do anything with, and then he gives you an order to purchase raw material for a portion of that contract, possibly 100,000 sets of our material. Then you have gotten a start. You can go out and buy some raw material. Then he will give you an order to fabricate maybe half of that, 50,000 sets, and then you really are getting some place. Then it is your own expense. You can go out and fabricate that and you don't know when you are going to ship it, but you can keep your men working during the month of February, for example, when his shipments may fall down, you can keep that production running pretty level, because you fabricate at your own expense. Maybe you semifinish a lot of that material and that helps materially. Then of course I haven't mentioned the diversification that automotive parts plants are trying so hard to do, to get into something entirely outside of this industry. I haven't seen our figures for this year, but I am sure that considerably more, or at least 30 percent of our sales volume in the year 1938 was entirely outside the automotive industry, and we tried to get that into something that doesn't have the same peaks we are in in the automotive industry, and that helps to transfer those men from one job to another. You run into all sorts of difficulty with the union when you do that because they don't want to be transferred.

The CHAIRMAN. This is just developing, then, is it, this effort to stabilize employment?

Mr. CARLTON. It has been worked out for a number of years, and I would say that the very serious effort has been going on about 7 years, until these people are carrying much bigger inventories than they used to carry. It wasn't very many years ago they carried 24-hour inventory in some of our customers' plants and today the majority of them are carrying 30 days. That helped us.

The CHAIRMAN. Could you reduce your experience to a rule or a standard that might be helpful to those engaged in other industries who are confronted by similar problems of unstable labor supply?

Mr. CARLTON. Senator, there has been so much thought given to this whole business of stabilization of labor that I know of not one more thing to do. We spend a great deal of time among ourselves as parts makers and with our customers, and I will say that we haven't

one customer that isn't giving us every bit of cooperation that he knows how to give, and if you get an idea and go to him with it he will try it out for you to try to help you cut out these terrible peaks and valleys. But until the public can change its buying habits I don't know what more can be done than we are doing now in this particular industry.

Dr. LUBIN. Mr. Carlton, prior to 1935, new automobile models were shown at the January shows, which meant that your automobile season was limited to about seven or eight months. In 1935 the industry changed its policy and put its new models out earlier and had the November show, thereby in a sense lengthening the automobile season. Has that had any effect upon your ability to keep your people more regularly employed?

Mr. CARLTON. I think it has, Dr. Lubin. There is a very great difference of opinion about that at the moment. You will remember last fall the automobile dealers' association was divided about that thing. Some of the dealers thought it was very bad and some thought it was very good. It possibly is a questionable thing right now, but from the standpoint of the parts manufacturer I think it is a very good practice. I think it tends to stabilize employment in the manufacturing end of the business.

Dr. LUBIN. It makes it possible, does it not, for you to keep your people employed over more months in the year and not have to build up your labor supply to meet a relatively shorter market?

Mr. CARLTON. I think it tends to do that.

Dr. LUBIN. I was interested in what you said about the place of patents in your industry, in reply to a question asked you by Senator King. You said that as far as your own industry was concerned you felt that patents had been a very effective factor.

Now after all, your industry is dependent entirely upon the sale of automobiles, and irrespective of the patent situation in your own industry, if automobiles weren't sold in large numbers, patents or no patents, you people would be in a difficult position. Do you believe that patents have had anything to do with the development of the automobile industry as such, I mean has it been a really significant factor? Would we have had the development we have had of General Motors, of Ford, Chrysler, and so forth, without patents, or without our present patent system?

Mr. CARLTON. I made the statement, which I will try to repeat exactly as I made it. In my opinion our patent system, which I like to call a part of the American incentive system, has been the greatest single factor in the development of the great automobile which we have today, which is being sold at the lowest price that it was ever sold.

Now, I make that statement after consulting this parts industry very carefully. I realize that so far as an original parts manufacturer is concerned, his business depends entirely upon the sale of automobiles. Once having signed a contract for a year, then we have to sit down and wait to see how much business comes in and we can't do anything about that, but we can do a lot about that before that year starts. If we can do something in the way of a part that makes that automobile more attractive to you, then we will make you want to buy a new car, and without any fear of our customers resenting it, I can say that I think that the parts fellow has contributed a very great deal to make this automobile what it is today, and when I say that

I am coupling with it the fact that without patents the parts fellow just wouldn't have been there. He couldn't have existed and developed and been what he is today.

Now, I am giving all the credit in the world to the great automobile manufacturer who by almost superhuman manufacturing methods and research and development of his own has done this, but for this industry which I so unofficially represent, I am also taking its share of the credit.

Dr. LUBIN. In other words, you don't think we would have 27,000,-000 cars on the road today if it hadn't been for our present patent system?

Mr. CARLTON. No, sir; I do not think so.

Dr. LUBIN. I would like to ask a question as to what happens in your industry when a manufacturer suddenly decides that next year he is going to make his own parts of a certain type. Does it frequently happen that manufacturers who have been purchasing their parts from people in your organization suddenly make up their minds that next year we are not going to buy any more, or only buy a few of them, and we are going to produce those things ourselves?

Mr. CARLTON. Oh, that happens occasionally, I think. However, they have been pretty fair with it, and I believe that in most cases they have had pretty good reason for doing it when they did it. Possibly the manufacturer of the part went to sleep; maybe he didn't continue the development and research that he should have; maybe his prices got out of line; maybe he got into a jam one way or another. And then sometimes it happens that nobody knows why he did it.

Dr. LUBIN. But it is not a frequent practice for the manufacturer suddenly to make up his mind that hereafter he will make the part?

Mr. CARLTON. Not frequent; it is very occasionally that it happens.

Dr. LUBIN. But it does happen?

Mr. CARLTON. It does happen.

Dr. LUBIN. One hears a lot of rumors, a lot of stories round to the effect that the parts manufacturer who had geared his output to the demands of a given automobile manufacturer, and who because of the orders coming through has put in large amounts of capital, new investment, expanded his plant, and then finally wakes up one morning and has the manufacturer say to him, "I want half a million units this year, but you will have to sell them at X price," a price which the parts manufacturer cannot afford to produce at and make a profit. Does that thing every happen in the industry?

Mr. CARLTON. Oh, of course, purchasing agents will be purchasing agents. They have to go through about so much of that hysteria; but salesmen have to be salesmen, and when it is all boiled down I think that is mostly conversation. I don't think there is any unfairness about the whole thing, as a rule. If I am selling an article at \$1.50 and the purchasing agent says "I am only going to pay \$1 for it" and I am simple enough to say, "Well, if that is all you will give I will take it," then I am a lousy salesman and my company ought to get a new sales manager. If I come out at \$1.40 or \$1.395, I am pretty lucky.

Dr. LUBIN. But the purchasing agent knows you have invested a large amount of capital in order to meet his demand, and there is no market but his, and you either take it or not. Chances are you have to take it or shut down. It isn't so much a question of being simple, it is a question of being in a position where you can't say "No."

I don't know whether that happens or not.

Mr. CARLTON. They have a terrific club in their hands, but they don't wield it. They wave it around a little bit, but when you get all through they put it behind the door and are pretty decent about it.

Senator KING. Has your association helped the effect of that club? You are still making parts.

Mr. CARLTON. We would all be out of business if they swung it very hard. We get along just beautifully, as a matter of fact.

The CHAIRMAN. The power exists, but it hasn't been exercised upon the three members.

Mr. CARLTON. It must be they don't want to put us out of business.

Senator KING. You are a part of the contract, so you may wave the club over the automobile manufacturers, who don't produce the commodities you are producing, and you might say, "We will not produce this particular rim for less than so many dollars per unit."

Mr. CARLTON. We are pretty meek.

Senator KING. You have to find consumers for your products.

Mr. CARLTON. We have a very limited market.

Senator KING. But you produce something like how much—\$800,000,000 a year?

Mr. CARLTON. That's right.

Senator KING. And the other organization produces two or three hundred million dollars a year?

Mr. CARLTON. That's right.

Senator KING. So that there is over \$1,000,000,000 you and your associates produce.

Mr. CARLTON. We don't dare tell them where to go for fear they might go, and we have great respect for their manufacturing ability.

The CHAIRMAN. I think the witness's answer that the industry is meek probably stands.

Are there any other questions, Mr. Dienner?

Mr. DIENNER. I have nothing further, Senator.

The CHAIRMAN. We are very much indebted to you, indeed, for this very interesting testimony, sir, and you may now stand excused with the gratitude of the committee.

Mr. CARLTON. Thank you, gentlemen, for your patience.

(The witness, Mr. Carlton, was excused.)

The CHAIRMAN. The committee will stand in recess until 2 o'clock this afternoon.

(Whereupon, at 12:05 p. m., a recess was taken until 2 p. m. of the same day.)

AFTERNOON SESSION

The committee reconvened at 2:20 p. m. on the expiration of the recess.

The CHAIRMAN. Mr. Dienner, are you ready to proceed?

Mr. DIENNER. Thank you, I am.

The next witness we shall call is Mr. Graham, an independent inventor. Mr. Graham, will you please be sworn?

The CHAIRMAN. Do you solemnly swear the testimony you are about to give in this proceeding shall be the truth, the whole truth, and nothing but the truth, so help you God?

Mr. GRAHAM. I do.

TESTIMONY OF MAURICE H. GRAHAM, MINNEAPOLIS, MINN.**AN INDEPENDENT INVENTOR**

Mr. DIENNER. Mr. Graham, will you please state your full name and occupation?

Mr. GRAHAM. Maurice H. Graham. I believe you would qualify me as an independent inventor.

Mr. DIENNER. What was your training which brought you to that state?

Mr. GRAHAM. Well, I went to high school 2 years and then I figured I needed a job more than I did any more school, so I hired out to a telephone company, digging post holes, and I worked at that for about 90 days, and then I became a lineman, and from that I became a trouble shooter, and from there I was in switchboard work. In 1914, when I practically quit the telephone business, I was district superintendent for the plant for the British Columbia Telephone Co. at Vancouver. In 1914, when the war broke out, the telephone company wanted to transfer me to Kamloops, and give me the commercial department as well as the plant department. I didn't like the commercial department so well so I came home. In 1915 I went into the automobile business.

I took up a Ford contract in the little town of Zumbrota, Minn., and I met another fellow that I had known when I was a boy. We bought the Ford agency. I operated that until 1925. I had done fairly well in the automobile business, and in 1925 there was quite a lot of trading, so I sold out the automobile business. I had a desire to get into the manufacturing business. I had always leaned more or less that way, so I took a year and went down to Florida and monkeyed around and came back to Minneapolis in the spring of 1926. I tried out several little penny ante inventions; some of them worked. For instance, a cigarette case I made would eject cigarettes out. I sold 250,000 and it was fairly profitable.

There was a limit to it, it was a kind of once-over and then it was all done.

I also tried out a garage door, an automatic garage door with a weight on it. You would come up to the post and trip the trip, at the post and the door would fly open, and when you got through you would close the door and wind the weight back up. But that wasn't so good. The door opener was all right but the doors would stick. The garages those days were made in such a way that when the wind was in one direction the garage usually leaned in the other direction and the doors were always stuck, so it didn't work so well.

Representative REECE. The idea was good but it didn't work.

Mr. GRAHAM. Yes; it was just one of those things. At any rate, I tried some little schemes, some of them would come out, some of them wouldn't, so in August of 1930 I went over to the McGraw Electric Co. which was then known as the Toastmaster Co. under the name of the Waters-Genter Co., and I asked Mr. Waters why he didn't make a toaster that wouldn't burn the toast, that I figured the one he had did burn toast, and he said, "Well, that is a hard job."

I said, "Give me a toaster and let me try it."

He did and I fooled with it for a while, and all of a sudden I conceived the idea that a clock was operating on a given time but a

toaster doesn't operate on a given time. As a toaster gets hotter, the time cuts down. In fact, it almost cuts in half. So I thought first that maybe the best thing would be to take the clock out, so I made a toaster for him with two electrodes that come up against the side of the toast, and when the bread toasted it would dry the toast out eventually so that the electricity wouldn't go through the toast any more, and then it would be automatically finished.

Well, that worked pretty good, but it left its mark on the bread and some people objected to that.

So then I made one where the bread was pulled down over a pin that had a very fancy little thermostat inside of a needle that timed the toast by the inner temperature of the bread. That was quite a popular toaster around the factory for quite a while, it worked very good, but it had its troubles. People toast molasses on bread, and butter, on bread, and everything else, and you have so many things to contend with.

So I was not so sure that the clock in the end was not possibly the best that we could make, if we could synchronize it with the time that it required to toast bread, from a cold toaster to a warm toaster, and one of the most difficult things in the toaster to overcome is when you have toasted until the toaster was warm; then you want to wait about 2 minutes, or you did wait about 2 minutes for some reason, you got an increase. On a minute and a half wait of a Toastmaster-toaster you have to increase the time about 30 seconds. Well, it was hard to cool off the piece of bi-Metal in the toaster as fast as the toaster cooled off. Finally, I found that by taking advantage of the radiant heat and various other conditions in the toaster that it was possible to do that. I built one; I built two of them, and I gave one to Mr. Waters and one to Mr. Genter, and they tried them out and they were very pleased with it.

It was during the first part of 1932 and things were not very good. So we started to put that in production. It was very simple; it didn't take a great deal of time. We tooled up and in August of that year we put that into production. It increased production some during that fall, we think—that is a guess, of course, as to what it did do—but anyway in the season of 1932 it was not on the profit side for the McGraw Electric Co.; 1933 it was on the profit side by considerable; 1934 was considerably better than 1933 and 1935, and so forth; and 1938 better than any one of the other years. I should judge that it amplified the business practically three times over what it was before that improvement was put on.

Well, after that, I was pretty well finished with the toaster business, I had a royalty contract with McGraw Electric Co. so I opened up a small shop or laboratory you might call it, and started to develop some other toasters. I developed one with a thermostat that would heat for a given time, and then cool for a given time during each toasting cycle. It had a lot of merit but the toasting art covers so many principles that you must cover. So I worked with several concerns; I would make a business of watching what somebody had in the electrical appliance field and if I did not think it was just right, or I could make it better, I would make a business of going over and telling them, why don't you do this or that?

So I developed a pressure cooker for the Pressure Cooker Co. with electric controls, the National Pressure Cooker Co. at Eau Claire,

Wis. That took quite a little time. I also made a flatiron and I licensed that, of which I will tell you later. It wasn't such a good experience, but it was a good flatiron. Then I shifted over into the coffee business. I had an entirely different idea for coffee urns. With most coffeepots the trouble is that you could only heat the water up about so far and then you started to circulate it through the coffee, then it should have no more heat, but to make coffee the way the book says it should be made is rather hard to do, so I think I pretty well accomplished that. When I got through with this particular coffeepot, I decided I wanted to show it to some bigger manufacturer to see what they could do with it. I took it up with the General Electric Co. and in conversation they were very much interested in this coffeepot, but they were also interested in this toaster that heated up and cooled off.

I negotiated a deal on the toaster first, which ended up in making a contract with the General Electric Co.—I don't know just how to put it—it was handled through the McGraw Electric Co., but it is the same patent that I got up that fall. So they took the coffeepot in their laboratory and studied it for about a year. You might wonder why I would take it to the General Electric Co. They have a large sales organization and a great many jobbers, over 100 jobbing houses and subsidiary jobbing houses, and I knew that this particular coffeepot needed advertising. I would like to show it to you.

Mr. DIENNER. Please do so.

Mr. GRAHAM. It looks just like a percolator; in fact it is built on a percolator but it has entirely different action than a percolator.

The CHAIRMAN. Is there enough to go around?

Mr. GRAHAM. Not now; I could make it. It has a basket, just the same as a percolator, and so forth, but what actually happens to the thing, it heats the water up to 150°; then it turns that heater off; then it has another trick in here that causes the water to heat further by no direct contact with the heating element at all, on a different principle that heats the water from there on up to 204°, where it seems to be the right temperature for coffee to finish.

The General Electric Co. was very much sold on it. In fact there is a contract agreed to between the engineering department and their patent department. It has not been signed yet by the General Electric Co., but it has been O. K'd as far as the patent division, and the engineering division at Bridgeport. The point of it is I have found that the General Electric Co., even though they have a large laboratory, they have many engineers, I have found that they were in lots of ways easier to deal with than some of the smaller concerns. I haven't had a bit of trouble with them.

The McGraw Electric Co. had a lot of engineers, seven or eight when I was with them. I had no trouble with them.

INTEREST OF INDUSTRIAL CONCERNS IN INDEPENDENT INVENTIONS

Mr. GRAHAM. As an independent inventor it is my contention that if you have got something that has any merit to it you won't have any trouble finding plenty of people in the large organizations that are glad to listen to you and see what they can do.

Mr. DIENNER. I take it, Mr. Graham, that you have taken out patents on the items that you have mentioned, such as the toaster and the coffeepot.

Mr. GRAHAM. I have.

Mr. DIENNER. Now, tell us approximately what you obtain in the way of royalties on the toaster, roughly.

Mr. GRAHAM. Well, I would have to get those figures, but it has been over \$113,000.

Mr. DIENNER. Have you an illustration of a device which you were unable to patent, unable to market?

Mr. GRAHAM. Yes; there is another one down here, if I can get it all together. This is not an awfully elaborate thing but in some sections of the country it answers the same problem as the toaster. It is for making biscuits, baking cake, it will bake most anything along the lines of cornbread, biscuits, and so forth. You mix your biscuits and put them in this pan here when it is cold; you don't have to pre-heat it or anything, you stick it in there, lift this up and set it over there, you set this for what you are going to bake.

Mr. DIENNER. That is a thermostatic control, I take it.

Mr. GRAHAM. It is more than that. The idea is that it takes 20 minutes or 15 minutes to bake some things. If you had a thermostat in there it would get hot before that period. You have to have more than a thermostat to give you that long a period, so when it is done the ball will fall down and shut off the current and you take it out when you get ready.

I had a deal negotiated with the Scott-Atwater Co. in Minneapolis. I was negotiating a deal with them, and we thought we had the possibilities of a pretty good patent on our control heater, but after a complete search we found a reference that just took all the teeth out of the patent; you might say all we would have was a design and we were never able to get anybody to take it because we couldn't get patent protection on it.

Mr. DIENNER. Would you tell us any criticism you have in connection with the securing of patents?

Mr. GRAHAM. Well, I have taken out, I assume, 15 to 20 patents in the last 10 years, all of that, and in that sum I have had one, two, three, I have had four interferences; one interference cost me \$8,000 and that is a lot of money. That was a toaster interference. Owing to my set-up I had a royalty contract with the McGraw Electric Co., even on a patent that had not been issued, and this particular interference was on this particular patent, so it was up to the McGraw Electric Co. to try to help out in the expense, otherwise they may lose the main patent that they were working on, so they had to co-operate with me, otherwise I don't know whether I would have wanted to go to that extent and spend that much to fight that interference with the patent.

I have had four other interferences, and it seems as though when you get a good item that you are ready to put on the market, if you put it on the market before the patent is actually issued it just seems to me that I always run into an interference; in fact, that has been my experience as far as I have gone.

I can't help but believe that there must be some way of shortening the action of interferences or declaring somehow who the inventor is other than, you might say, leaving it to this one and that one and

the other one who may want to come in and witness this, that, and the other thing. It is just a complicated set-up. I wish there was some way it could be changed. That is the only complaint I have under the patent system.

INABILITY OF INVENTOR TO ENLIST CAPITAL WITHOUT PATENT PROTECTION¹

Mr. DIENNER. Let me ask you one more question. What would be your attitude in regard to any change in the patent system which would allow anyone to come to you and demand a license on the payment of royalty. How would that affect your situation?

Mr. GRAHAM. What was that again?

Mr. DIENNER. Suppose there were provision in the law allowing anyone to come to you and request a license, offering to pay royalties. How would that affect your situation? In other words, compulsory license law.

Mr. GRAHAM. I don't think in the electrical appliance field that I have ever built an item that I could go out to somebody and get him to build it if he only had the use of it for a year or two or three, as the case might be, and then the so-called "gyp" manufacturer could come in and take advantage of it, because this particular coffeepot is so much different and yet it looks just like a coffeepot, and somebody has got to spend a lot of money in advertising to let the public know what this thing does. It is not a coffeepot, that is an old-fashioned percolator, because that is a discarded system. With the Silex and the other ways of making coffee, you can hardly sell a percolator today, and this looks just like a percolator. All manufacturers want to get into a metal coffee maker if they can, because with stainless steels and various other alloy steels there is a steel that is just as good for making coffee in as glass. If I would go to them, for instance the General Electric Co., and ask them to spend \$50,000 to advertise this, then in a given time anybody could come in, I don't think I would ever be able to sell it. I couldn't interest them in it.

Mr. DIENNER. Mr. Chairman, that is all the inquiry on which I wish to examine this witness, unless the witness has something further to say to the committee.

The CHAIRMAN. Do any members of the committee desire to ask Mr. Graham any additional questions?

Dr. LUBIN. Mr. Graham, do you still own the patents on these devices and rent them on a royalty, or have you sold some of them?

Mr. GRAHAM. Some of them I still own, some of them I have had the patent transferred to the man—well, for instance, the McGraw Electric Co. has a great number transferred to them on a royalty contract. I have that come up every once in a while: "Will you assign the patent to us, or are you bound to have just an exclusive contract?"

I don't know. In some instances it is better to hang onto the patent, and in some instances it is just as well to take on the exclusive contract and give them the patent.

Dr. LUBIN. Is this biscuit device on the market now?

Mr. GRAHAM. No; I have never been able to put it on the market, because I haven't got a patent and I can't get one that amounts to anything on it. There are designs and a few little features to it, but it is one of those patents like many of them, that don't mean anything.

¹ This subject is resumed from p. 995, *supra*.

Dr. LUBIN. Is there any danger, in the event it might be put on the market, it might be held infringing some other patent?

Mr. GRAHAM. No. There is an old reference that I found, an expired reference, but it just took the teeth out of the possibilities of getting a claim that was any good on this.

Dr. LUBIN. In consulting with various manufacturers about that device do they feel there is a market for such a thing?

Mr. GRAHAM. Yes. This has been made for possibly 4 years. The Knapp-Monarch Co. came out with a biscuit maker, anyway, and the General Mills has tried to get me to find some way to simplify this so they could put it out with their Bisquick. I may some day get hold of some way of putting it out as a premium, but so far as putting it out with a staple manufacturer as a year in, year out product, I don't think it is possible to do it.

The CHAIRMAN. Why not?

Mr. GRAHAM. I can't get them to take it. The tool cost is too much to tool up for a thing like this, with the possible profit there is in it and then have somebody else come in and copy it and take away that portion of the business that there is.

The CHAIRMAN. In other words, to bring an instrument of this kind into production a patent is necessary.

Mr. GRAHAM. I think so.

The CHAIRMAN. But on the other hand you have there a device which is actually the result of prior expired patents which never went into production.

Mr. GRAHAM. That is true to some extent. The reference is a long ways from this type of a device. There are many patents that are cited to a fellow that are not practical and still they have something about them that makes the practical device hard to get into perfection and get any claim on it.

The CHAIRMAN. And do you mean to tell us you haven't been able to find a patent lawyer in Washington who is unable to distinguish this from the others?

Mr. GRAHAM. I live in Minneapolis.

The CHAIRMAN. There is an opportunity here for somebody, I would think.

Mr. GRAHAM. Then again, in Minneapolis we are located quite a little way from the logical manufacturing center. We have many things against us; we have freight rates against us up there and, where we go to a home manufacturer, if we can't protect him so that he can have a protected price, it is difficult for him to compete with the eastern manufacturer.

The CHAIRMAN. What is your judgment, in the light of your experience with this device, with respect to the recommendation which has been made to us practically universally by all of the witnesses thus far, that the period of exclusive use of any patent should be limited to 20 years?

Mr. GRAHAM. Well, I know of only one patent in my life that ran 17 years, speaking now of electrical appliances. I have never seen more than one patent that actually lived its life in actual production. I think the 20-year idea has its merit. It may hurry some inventors to try and answer an amendment quicker and finish the patent sooner.

The CHAIRMAN. But if the reference in this case had not expired it would be possible for you to acquire that right and thereby put this machine on the market.

Mr. GRAHAM. Well, that didn't have much bearing on it. I still could put this on the market without interfering with that patent, because it was an old patent.

The CHAIRMAN. But I understood you to say that it was because of that patent that you can't get the protection that you want for this.

Mr. GRAHAM. I know; it was an old patent, but nevertheless that was an old patent, so this would be an old patent, so anybody could copy it.

The CHAIRMAN. But if the life of that old patent had not expired, it would be possible for you to acquire it and enter into an agreement with the holder of that patent, and then you would have the patent protection that you say you need.

Mr. GRAHAM. Well, I may understand it a little wrong as far as this 20-year idea, but as it is now, some of our patents—I have had one 6 years before I got it issued, one I had several interferences with, and that will make 23 years on that one.

The CHAIRMAN. That is exactly the point. The suggestion has been made that the period during which a patent may be permitted to remain in the application state should be shortened, or if it remains in the application state, that the term of exclusive use shall be cut down, so that altogether the period is 20 years.

Mr. GRAHAM. I think I would be in accord with that 20-year idea. I believe it would be better for the average small fellow who is trying to make both ends meet.

The CHAIRMAN. It is very interesting in the light of your experience and in this respect.

Dr. LUBIN. I am interested in the baker. Did you have a search made on that device before or after you built the instrument?

Mr. GRAHAM. That is where I stuck my neck out a little wrong. I usually do, but I did not on this one, and then the funny part of it is, after I made the search, it was about a \$60 search, I had no reference, but when I was down here one time and I was looking through the Patent Office and found it myself.

The CHAIRMAN. If there are no other questions, the witness is excused. We are very appreciative.

(The witness, Mr. Graham, was excused.)

Mr. DIENNER. Mr. Chairman, may I call my next witness. It is Mr. Baekeland. Will you please be sworn, Mr. Baekeland?

The CHAIRMAN. Do you solemnly swear the testimony you are about to give in this proceeding shall be the truth, the whole truth, and nothing but the truth, so help you God?

Mr. BAEKELAND. I do.

TESTIMONY OF GEORGE BAEKELAND, VICE PRESIDENT OF THE BAKELITE CORPORATION, NEW YORK CITY

Mr. DIENNER. Mr. Baekeland, will you please state your full name and occupation?

Mr. BAEKELAND. My name is George Baekeland. I am vice president and secretary of the Bakelite Corporation, and president of two of its subsidiaries.

Mr. DIENNER. Will you please tell us your education and training for the position which you now occupy?

Mr. BAEKELAND. I received an A. B. degree from Cornell, an E. M. from the Colorado School of Mines. I practiced mining engineering until 1923-24, when at the request of my father I gave up my profession with some reluctance and went to work for the Bakelite Corporation. I have been with Bakelite Corporation since that time, and, well, a jack of all trades, and my experience has been somewhat rounded and full, I think.

Mr. DIENNER. Are you familiar with your father's earlier work preceding the invention of bakelite?

BACKGROUND OF BAKELITE CORPORATION'S FOUNDER

Mr. BAEKELAND. Well, the earliest work that brought him any prominence was done at a time when I was about born, or perhaps a year or two previous to it. He invented Velox paper in the early nineties. He went into partnership—it was not a corporation or a company, a pure partnership—with a man who put up the necessary money. At the time my father had only recently resigned as professor of physics and chemistry and had gone into photographic research work, following work he had done as a student in photochemistry. The result was his invention of Velox paper, or photographic paper to which he gave the name Velox, which was manufactured under this partnership arrangement.

He took out no patent; it was a secret process. The business was small, of course. He alone knew the formula, although there was a written formula sealed, I believe, I am not sure of that, in escrow in case he died. He himself mixed the emulsions daily that were used for the making of this photographic paper.

Perhaps some of the members of the committee will recall that in the early days of photography it would take about half an hour in sunlight to get a print. This Velox paper made a print instantaneously, and in that way greatly added to the improvement in the art.

The paper, of course, became strongly competitive with the old types of paper on the market at that time, and the Eastman Kodak Co., on two occasions, came to my father and his partner with a desire to purchase the business. They were reluctant, however, to part with their business, but finally, when it became a nice running business and the troubles were over and it became routine manufacture, I think my father became a bit bored with the whole thing, and it was decided to sell on the third attempt by the Eastman Co. to purchase, so the whole thing was sold, lock, stock, and barrel, and my father dropped out of that business and went into the thing that he wished to do.

He was then quite comfortably off. In fact, for those days he was quite a wealthy man. He devoted his time to chemical consulting work and at his home in Yonkers he converted an old barn, a stable, where he carried on work in a number of fields, and at the time of the Russo-Japanese War, among other things he was working on synthetic camphor. Natural camphor had become very high-priced owing to the Japanese War. He was not the only one, however, who was working at that time on that particular problem. He was also working on synthetic shellac. Shellac, as you may know, is a product from an insect in India.

DISCOVERY OF THERMOSETTING PLASTICS

Mr. BAEKELAND. The result of those researches led him to certain observations and conclusions, and following these he developed the first thermosetting plastic. Perhaps I might just explain that a little bit, because this business on which I am going to touch today is really the foundation of the plastics industry as we know it. Until my father's invention of these synthetic resins which were thermosetting, plastics were what we call thermoplastics; they never became hard except on cooling, they were cold setting rather than heat setting, rather than thermosetting. The plastics in use then were shellac (it is still used for making Victrola records, it was then used for making a number of things besides Victrola records) and the other one was hard rubber. Hard rubber was at that time used as an electrical insulator in electric installation, which of course had not developed to its present stages, but it was used in the main electric insulators aside from porcelain and glass.

The trouble with these old plastics was that upon heating they always softened, just as when one puts a Victrola record near a radiator or in the sun it will soften and fold over. Of course such a plastic as that has very great limitations because so many insulators and other products which can be made of plastics have to withstand higher temperature than normal temperature.

This was an entirely new plastic in this sense. The old plastic was put into a warm mold and as soon as it became plastic, until it was cooled it remained plastic, so while it was in the mold the mold had to be chilled, and then having become chilled it could be opened and the piece could be taken out without becoming deformed in handling or setting down on the bench. That applied to the shellac and to the hard rubber plastics then in use.

The curious and unique thing about these new plastics that were introduced by my father was this: The technique was very much the same; it is placed into a hot mold; the heat of that mold begins to fuse or soften this plastic so that when pressure is applied to the die, to the mold, the plastic flows through the mold and takes the form and shape of a mold, but continued heating in that mold does something that hadn't happened before. Continued heating brought on a chemical reaction within the material itself in the mold and it set up hard and then having reached that point the mold could be opened, the piece taken out at a temperature so hot that it isn't convenient to handle, and there was no deformation and no more change, and any further heating would never soften that material again.

Unlike shellac and hard rubber, after this material is once set—

The CHAIRMAN (interposing). What is it, the amount of heat or the length of application?

Mr. BAEKELAND. A combination of the two; low temperature takes longer; high temperature requires a shorter time.

After the material had once become cured it couldn't be dissolved and softened with solvents. Shellac, hard rubber, and those things are all subject to being dissolved in ordinary organic solvents. So was this new plastic that my father invented, in its initial stage, but once it had been heated and set it wouldn't soften and couldn't be dissolved in any solvent.

Since then there have been certain solvents, but they are very unusual things, so that for all intents and purposes these materials are not attacked by solvents, oils, alcohol, benzine, anything of that kind, and they are not affected by heat.

IMPORTANCE OF BAKELITE IN AUTOMOBILE MANUFACTURE

Mr. BAEKELAND. They made possible things that have never been possible before. Mr. Kettering testified here I understand last week. He recognized he could not have made a self-starting lighting system without these Bakelite molding materials. In a motorcar the insulators are subject to quite high temperatures and they are also covered with grease, oil, or gas, and what not, and those two things would have ruined any known insulator except glass or porcelain, which were not at all adaptable to automobile installation; they are very cheap materials and if they were to be used today they would have been used in the past. This material or these materials of plastics have made possible the development of a great many things which today we see in all business and which are only possible owing to the peculiar characteristic of these materials.

It is the combination of characteristics which has given them the very wide use and utility which they have enjoyed. These first materials, first resins, invented by my father were patented, patents issued in 1909, they were applied for in 1907; they went through the office in 2 years, which is rather good time—or less than 2 years. A business seemed to be indicated from what was at hand and my father with his own money and with the money of friends whom he invited in, formed a company in 1910, General Bakelite Co., to begin the manufacture of these materials.

The company was financed by the original stockholders privately and it might interest this committee to know that although this company has grown and has increased its investment and plants and all that, several times to a very great degree, there has never been another cent put into the business and the company has never borrowed money, never put out a bond issue. The stockholders were not greedy and they were sensible; they saved from earnings when they began to make earnings, enough to keep up and continue the research work that was necessary, additions to plant, increasing the selling force, and they have always maintained or had maintained, or rather the tax laws made possible, a conservative and sensible dividend policy.

Fortunately none of them were people who wished to get an inordinate amount of money; they were more interested in getting good materials and seeing that the business was sound and managed in a sound and sensible financial way.

To digress for a minute, it might interest the committee to know that as a result of that policy in the year 1931 and '32, when we were in the midst of the depression, out of surplus, out of sums saved from past earnings, we built a four-and-a-half-million-dollar plant, at a time when business was at a standstill; we placed orders, gave men employment, and built a four-and-a-half-million-dollar plant. That was only possible through this policy that had been carried on through the years.

The CHAIRMAN. Was there any displacement that you know of?

Mr. BAEKELAND. Displacement?

The CHAIRMAN. Did the development of this industry displace any other industry?

Mr. BAEKELAND. The only thing it did was to—I think it cut down the hard-rubber business, which was a small business at that time, anyway, because of the few materials, the few articles that were displaced in hard rubber by these Bakelite products were offset—well, I should say a thousandfold by the new products that were made which were never made of hard rubber.

The CHAIRMAN. Then we are to understand that as a result of this invention, and the development of this industry, we have new uses which in the main are not substitutes for any other uses?

Mr. BAEKELAND. Oh, yes; entirely so.

The CHAIRMAN. And new materials which are actually not substitutes for old materials?

Mr. BAEKELAND. It has created a new business and it has created new products which never had been made, and as a matter of fact today could not be made without these materials.

Mr. PATTERSON. In other words you are telling us, Mr. Baekeland, that new employees—you took on new employees and it helped the unemployment situation?

Mr. BAEKELAND. Yes.

Mr. PATTERSON. How many byproducts have you from the original plastic invention, or secret process?

USE OF BAKELITE IN 35 MAJOR INDUSTRIES

Mr. BAEKELAND. How many products are made today? Well, I didn't believe it would be possible to answer that question until the other day I asked in our office whether we had such a record, and I found we did. We sell to 35 major industries and they have a record at the office of the articles made in each industry and they amount to over 15,000 different articles.

Mr. PATTERSON. Different articles?

Mr. BAEKELAND. Yes. For example, a radio tube base would be one article; a safety-razor handle would be a second one; a switch plate would be a third. There are 15,000 such made of our plastics.

The CHAIRMAN. Now of course in each one of those instances which you have mentioned, the Bakelite is a substitute for something else?

Mr. BAEKELAND. There were no radio tube bases in those days.

The CHAIRMAN. Certainly there were razor handles?

Mr. BAEKELAND. Safety razors? There were no safety razors—oh, yes; they were just coming in. That replaced brass.

The CHAIRMAN. How about your light-switch plates?

Mr. BAEKELAND. They were brass.

The CHAIRMAN. So there was a little substitution?

Mr. BAEKELAND. A little substitution, but over all very little substitution; it is mostly new business.

Mr. PATTERSON. Over all you are pretty well convinced that you helped the unemployment situation?

Mr. BAEKELAND. Oh, yes; no question about it.

Mr. DIENNER. Mr. Baekeland, have you some samples of articles that you could exhibit? I think that would be very interesting.

Mr. BAEKELAND. I might have some here; they may give a clearer idea of what we are talking about.

Representative REECE. To what extent is this new plastic material that is made out of synthetic material derived from wood or cotton fiber, such as rayon, the base for rayon?

Mr. BAEKELAND. We make a number of plastics. We make phenolic plastics, aminoplastics, cellulose acetate plastics, glyptal plastics, and polystyrenes.

Representative REECE. Just new material, is it, based upon your process?

Mr. BAEKELAND. Yes. Here is a phenolic.

Mr. DIENNER. You may be referring to cellulose acetate, a clear almost glass-like material?

Representative REECE. Yes.

Mr. BAEKELAND. Here is a piece of cellulose acetate that goes on the head of the steering wheel of a car; that is cellulose acetate.

Representative REECE. But that is made on your process?

Mr. BAEKELAND. Well, you know we are plastics headquarters; we make different—you might say comparing us to the metal people, we have several metals that we turn out; one might be brass, another lead, another one iron. Something of the sort. They are not identical in characteristics. Each has its own characteristics and fills its own particular needs and uses.

Now this thing here can be made colorless and where they want a light color like this why we give them cellulose acetate, the amino or polystyrene-resins which are colorless. This material can only be made in amber color. Here is the pure resinoid here. So that where color does not make any difference and where certain other qualities are wanted, then we give them something, we will say, like this for the telephone company. This is a piece for the telephone. That is a phenolic plastic. That is the original thing my father invented. These phenolic plastics are the ones that really started the plastics industry as we know it today, and then followed these other things.

Here is a polystyrene. Now that material incidentally is an interesting thing. You see they are made in quantities of this kind; those are put through automatic machines and they make a quantity of them, and they break them off. Now this incidentally is an insulator for a television set. The peculiar characteristics of this material are such that nothing else will serve as well for television. The efficiency and the high degree of perfection in television require material of these peculiar electrical characteristics. This material here does not have it. Neither do some of these others that we have, so these several materials find their uses in a variety of places where their peculiar characteristics are demanded or are preferable.

BAKELITE PATENTS

Mr. PATTERSON. Mr. Baekeland, do you recall how many patents you have?

Mr. BAEKELAND. We have at the present time in force 265 patents. We have had a total of 365 patents.

Mr. PATTERSON. With applications pending?

Mr. BAEKELAND. We have applications pending; yes.

Mr. PATTERSON. Would you have done without the patent system? Suppose you did not have that protection, suppose you had not had that protection?

Mr. BAEKELAND. Well, I don't think my father would have gone ahead and tried to build a business on it. The answer to that would be, of course, then somebody else would do it. That might be the obvious answer, but the real answer is simply this, that having patent protection, living and working behind, we will say, glass walls that protected him but which anyone could look in through and see what he was doing, he had an opportunity to carry on his work and improve these products, develop new ones, and work on them in safety, develop a business and do work which he could not have been induced to do if everything he did were to be copied by those who had not been subject to the risk and the expense of development and research and introduction to which he was subject. There is the trouble with not having a patent. It is not so easy to introduce new materials or new uses.

The pioneer always has to overcome resistance, has to do the demonstrating, and showing that these things are necessary and useful, and then having done so and established a market, his competitor can come in without any of that pioneering expense. Now a patent of course gives the inventor, the pioneer, the protection which he needs for that pioneering work.

Mr. DIENNER. Were your patents ever in suit?

Mr. BAEKELAND. We have had three patent suits. One immediately after the first patents issued, which was won; another one later, about 1920, which we won; another when some of the patents which had previously been adjudicated were infringed and we won that one.

Mr. DIENNER. And your patents were all sustained?

Mr. BAEKELAND. They were always sustained, and we have never had to defend any patent suits; we have always taken the attitude that patents were good and we have not trod on others' toes.

Mr. DIENNER. One more question. Along that line, when your basic patents expired, and the market was then open to others, did others then manufacture the material under the original patent?

Mr. BAEKELAND. Yes. A number of competitors or new companies came into the field and some of our larger customers also were tempted to go into the manufacture of plastics on their own for their own uses. So that we have lively competition today and the patents under which we are operating now are not basic patents; they are just improvement patents.

Representative REECE. Are you able to estimate the number of people who have been given employment as result of the creation of this new industry?

Mr. BAEKELAND. That would be a difficult thing for me to do. I tried to find out. We have a great many customers who are in businesses that just would not exist without these materials.

This, incidentally, is a distributor head for a Delco ignition system. Here is a phenolic denture, a little gruesome, I suppose, but a very excellent denture, the best there is, as a matter of fact. And this is a small radio cabinet. Here is a grinding wheel. The interesting thing about this is that these wheels turn at twice the speed that the best wheels heretofore had been able to turn.

The CHAIRMAN. What is that?

Mr. BAEKELAND. A grinding wheel with a phenolic Bakelite resin.

The CHAIRMAN. That is a substitute?

Mr. BAEKELAND. Well, I will tell you what it is a substitute for; it is a substitute for clay, and the people who used to make the clay

wheels still do make clay wheels, they take the clay and fire it. Or they take the rubber; they also make some rubber wheels, and it does replace, we will say, clay, a small amount of clay and a small amount of rubber, but these wheels will turn at twice the speed the ordinary wheel turns.

The CHAIRMAN. Would it be proper to say that with respect to most if not all of these articles which you make, even in the case where they are substitutes, they can be made so much more cheaply and of such a character as to perform so much more efficiently?

Mr. BAEKELAND. Better service, exactly.

The CHAIRMAN. Than the things for which they are substitutes that there is no real comparison?

Mr. BAEKELAND. No. I do not know—

The CHAIRMAN. That is the impression I get from what you say and I am wondering—

Mr. BAEKELAND. That is the right impression. I know of no case where we have done anybody any harm or hardship. Most of this is new, most of these are improved uses. Now, for example, a lot of those cut-off wheels—that might be a cut-off wheel there—were used instead of hacksaws and things like that, and they will cut through steel and glass and everything at a tremendous rate, and they have a different cutting effect. For example, a fine steel tube can be ground down without drawing its temper with these wheels; they run very cold; they run much faster than the ordinary wheel, and therefore they do more work. The amount of cutting is in direct proportion to the speed, the peripheral speed of the wheel, and those wheels run twice as fast as the ordinary vitrified wheel, and they do the work in half the time, and they have also changed some of the machine tool technique; instead of milling operations they use grinding wheels now.

Mr. DIENNER. The sanding wheels for grinding automobile bodies and the like; there is an interesting point.

Mr. BAEKELAND. Well, there is a disk about the size of that grinding wheel there that is used on the end of a flexible shaft. The shaft being at right angles to the face of the disk and it is used in the automobile industry and in other places, but particularly the automobile industry to dress down steel bodies.

The body has little dents in it that you fill with solder and the body also has little bumps on it. Those have to be dressed down and smoothed out before they can put on the primer and paint coats. Those disks were made of a paper-cloth combination with animal glue and grits, like ordinary sandpaper. Of course, if the glue was soft the disk would be useless. They resulted in dust; the men had to wear masks; it was unpleasant and dangerous if the proper precautions were neglected. This disk was waterproof, which made it possible to do all these sanding operations with a heavy dose of water which eliminated all the dust hazard.

Mr. PATTERSON. Mr. Baekeland, all these objects, these products that we have here for inspection, every one of them is made of Bakelite?

Mr. BAEKELAND. Yes, sir.

Mr. PATTERSON. And the variation was so minor that it wasn't necessary to go to the Patent Office?

Mr. BAEKELAND. Oh, yes; in some of them there is quite a little difference. You know, we have several thousand products that we sell.

Mr. PATTERSON. I asked the question to draw out that answer, because you just a moment ago said you had a great many patents, but the basis is Bakelite.

Mr. BAEKELAND. Bakelite is a trade name; it is not possible to call any material Bakelite because we make such a wide variety of materials so dissimilar that if anyone would ask for 10 pounds of Bakelite, with all the good will in the world we don't know what he might want; he might want a liquid, he might want a solid powder, he might want a number of things.

Mr. PATTERSON. What do you call that glass?

Mr. BAEKELAND. That is a pure phenolic resin.

Mr. PATTERSON. Wouldn't the layman call that Bakelite?

Mr. BAEKELAND. I don't know. He might call it Catalin; he might call it Durez.

Mr. PATTERSON. Of course, we don't know the professional names.

Mr. BAEKELAND. There are a great many names in the trade which are currently used.

Mr. PATTERSON. Congressman Williams asked to what extent this is breakable.

Mr. BAEKELAND. Oh, that is breakable, not as breakable as glass, but it is breakable. Now there is another example. That thing is more friable, more breakable, than, we will say, this material. This material has a certain shock resistance, and so have some of those others that you have there, which those phenolic resins don't have. They have great tensile strength and these phenolic resins have been used for many years in making gears. They impregnate canvas with the original uncured resin in an alcohol solution, coat the canvas, the solvent will dry out and then in a hydraulic press they press this pile and get a very tough, hard, high-shock resistant material which is used in gears, which were used in airplane propellers during the war, and here is an automobile gear. Now most of the cars going around the roads have these gears in the engine, timing gears.

The CHAIRMAN. How long will that gear stand up?

Mr. BAEKELAND. Oh, it will last as long as the car. It will outwear metal gears.

The CHAIRMAN. Heat resistant?

Mr. BAEKELAND. Oh, yes. You see, this is down in the engine crankcase, it is pretty hot down there. They use them on rolling mills, coal crushing mills, paper mills, wherever they want silent gears.

The CHAIRMAN. That is a substitute for metal gears?

Mr. BAEKELAND. That is a substitute for metal gears.

The CHAIRMAN. We are finding lots of substitutes here today.

Mr. PATTERSON. Your company is known as the Bakelite Corporation.

Mr. BAEKELAND. Yes, sir.

Mr. PATTERSON. Most of us think that all your products have something as a base, and I don't know what that something is—I think of vaseline as a petroleum product, and that is what I am trying to unravel concerning your products—what is the base?

Mr. BAEKELAND. I will go into that. We have here before us a variety of materials which are made of different materials, too, they are not all the same. For example, here is a door knob that is a phenolic resin. Carbohic acid (phenol) and formaldehyde are reacted together in a big kettle sort of thing, and the result of that is a sirupy

resin; in the warm state it is sirupy and when chilled it is hard. That is the initial resin before it has been heated enough to set it, heated enough to cure it.

Phenolic resin is then used in various ways. For that gear it was dissolved in alcohol, the canvas was saturated with it. In this instance that resin was ground to a powder, with wood flour, and molded in a steel die in a hydraulic press.

The CHAIRMAN. Now this gear was constructed, if I understand you, by laying together several layers of impregnated canvas.

Mr. BAEKELAND. Yes.

The CHAIRMAN. And then after that had been done, it was cut into the form of a gear?

Mr. BAEKELAND. That is right, it was put in a gear cutter; yes.

The CHAIRMAN. How hard is it? What do you have to use to cut that?

Mr. BAEKELAND. They use regular gear-cutting equipment, but there is a peculiar thing about these phenolic resins; they are very hard to tool, they are harder on tools than metal is.

The CHAIRMAN. That is what I was getting at. You used a metal tool, however, to cut this?

Mr. BAEKELAND. Oh, yes; there was a metal tool used. The great advantage of these materials, and the reason for their wide utility, is they don't need machining operation. A thing like that comes out of the mold as you see it. The telephone handle the same way, the distributor head, come out as you see them. There isn't any further machining or further mechanical operation, sometimes a little buffing, or where there is a fin like that on it, we cut that off.

The CHAIRMAN. Could you make a cutting tool out of this material?

Mr. BAEKELAND. No, I don't think you could.

The CHAIRMAN. Isn't it hard enough for that?

Mr. BAEKELAND. It hasn't got the strength of steel for a cutting tool. It wouldn't stand up. It hasn't got the toughness that steel has.

Now, that material there has a tensile strength around 15,000 pounds to the square inch, and that is all it has.

The CHAIRMAN. So our iron mines are still safe from this?

Mr. BAEKELAND. Oh, very safe.

Now here is another type of resin that is used here in these pencils. This is a Glyptal resin, and it is akin to the material which is used for making Dulux finish, the Dulux finish that du Pont makes. That is a Glyptal material. We use it on grinding wheels and some other commercial applications. These pencils are made of it. That material is colorless and it lends itself to this use. In this case, this is a machining operation. That material is not easily molded.

The CHAIRMAN. Have you counted them?

Mr. BAEKELAND. No; I don't need them back. If they are useful to anybody, you are welcome to them.

We also developed a new material in 1927 and 1928, we developed a peculiar kind of phenolic resin on which we got a patent, and this resin did something that had never been done before. Here was a synthetic resin which was soluble in oils for paint and varnish. If you remember paint and varnish, if you dropped a little alcohol on it, anything of that kind, it dissolved away. Put it on a boat or out-of-doors, and very shortly it was all gone. The wood was discolored,

and it was all gone. This new resin, which was patented, made varnishes which were unheard of before. Their weathering characteristics were phenomenal. They were unattacked by sulphuric acids, alkalies, heat, alcohol. You could take a table like this, beautifully finished, and pour brandy on it, light the brandy and let it burn off, and the finish wouldn't have been touched. You couldn't have told where it happened.

Well, that is a trick demonstration. It isn't important. The main importance was the great durability, the great life of these finishes, and the high luster and protection that they gave.

The story is an interesting one from a patent point of view. Here was a company, the Bakelite Corporation, which was nationally and internationally known, whose products were accepted whenever they brought them out in the various fields in which they had been serving. If we introduced something in the electrical field or the grinding-wheel trade, they accepted it and put it through a few tests, and they recognized when we came out with something new it was worth looking at and something useful.

But we were not known in the paint and varnish field. In spite of our reputation, our demonstrated ability to introduce new products and new things, here is a new product, very useful in the paint and varnish field, and we couldn't get anywhere with it. Nobody would listen to us; nobody would pay any attention to it: "No; we don't want to be bothered testing that out. We have so many of these things."

We have no desire to go into the paint and varnish business. We can't go into the grinding wheel industry and the radio industry and all these things. We stay out of them. We supply the materials and that is all we do. We don't get into competition with customers or anything of that kind. We certainly didn't want to go into the paint and varnish trade. It meant building up a whole new organization, a new sales force, and we were not going to do it.

There were about 1,100 companies in the paint and varnish business and we wanted them as customers and not competitors. We would have been the one thousand one hundred and first, and we didn't want to do that. We would rather have 1,100 customers than 1,100 competitors. But because we couldn't go anywhere with it we did go into the varnish business temporarily, solely for this purpose: to take business away from existing varnish companies, and having taken a man's business away from him, he then takes you seriously. So we went at it.

We picked the marine field because that was the tough one. What would do in the marine field would do anywhere. So when we went out in the marine field and started taking accounts away from the well-known old-line paint and varnish people. As soon as they started to lose accounts they started to take us seriously, and we went to them individually and said, "If you want this account back again, if your customer wants this stuff, not what you used to sell, we will sell you the resins, we will give you the formula, and we will do everything we can to help you."

So we eased out of that and we are the leaders in that field today. We do a big business in it. We have the outstanding materials, materials that are used wherever real quality is wanted.

Mr. PATTERSON. Have you any competition with this?

Mr. BAEKELAND. Oh, plenty.

Mr. PATTERSON. I ask that for the record. What is it, Mr. Baeke-land?

Mr. BAEKELAND. Oh, we have a number of competing companies. We are the only company, however, that make all of these. Our competitors all make either one or the other of these that I have pointed out. We are the only ones who make all of them.

Representative WILLIAMS. You are the pioneers in that field?

Mr. BAEKELAND. Yes, we are.

Representative WILLIAMS. Organized in 1909?

Mr. BAEKELAND. 1910.

Representative WILLIAMS. What capital at that time?

Mr. BAEKELAND. I am not sure, but I believe it was \$250,000.

Representative WILLIAMS. And what is it now? What has it grown to?

Mr. BAEKELAND. There were common-stock dividends as the business grew. In 1927 there was a 150-percent preferred dividend; 6½ percent preferred stock was issued as a dividend. There have been no increases to capital except through earnings, no new money, no new financing, no borrowing.

Representative WILLIAMS. You have increased it by the issuance of dividends, stock dividends?

Mr. BAEKELAND. Yes, sir. As the business grew a stock dividend was declared. Our capitalization, however, is still low. It is about 8½ million.

Representative WILLIAMS. How many are employed by your company now?

Mr. BAEKELAND. We don't employ a great many people. Our manufacturing processes are such that one man can handle a whole battery of chemical apparatus, and our total pay roll has never exceeded, I think, about 1,300, but it is interesting to note that in 1936 it was double that of 1929.

Representative WILLIAMS. And has it increased since 1936?

Mr. BAEKELAND. Not much. It is less now than it was then, I think.

Mr. DIENNER. How many men do you have in your laboratory?

Mr. BAEKELAND. We have a research laboratory; we have 250 men there. Sixty-five percent of the cost of our research is pay roll; the other 35 is taxes, depreciation, and insurance and such things as that. Our budget for 1938 was \$682,000 for research. It has been over or around half a million dollars a year for quite a number of years. And on our research we depend for our safety and future existence. Without it I don't think we could maintain our organization. I know we couldn't in this field where it is very competitive and where there are a great many developments going on all the time, and an increasing amount of research work.

The CHAIRMAN. What contributions have been made to improvements of these various devices and methods from outside of your organization or your laboratory?

Mr. BAEKELAND. There have been some of them from outside.

The CHAIRMAN. What proportion of them would come from outside?

Mr. BAEKELAND. At the present time of our sales I should say 95 percent are our own.

The CHAIRMAN. In other words, the bulk of the extension of this art is a result of your own laboratory, your own work?

Mr. BAEKELAND. Yes, sir.

The CHAIRMAN. How many persons are employed in that sort of work?

Mr. BAEKELAND. In research work, 250. That also includes some janitors and a few maintenance men around the laboratory.

NECESSITY FOR PATENTS IN PROTECTING RESEARCH WORK

The CHAIRMAN. Yes.

Are all your research workers under obligation to give to the company the patents which they may devise and the discoveries which they make?

Mr. BAEKELAND. Oh, yes; we supply them with the equipment, we pay them to do the work, we direct what work they are to do. We can't permit our research men to work on their own. They might go into very interesting fields which would be of no use to us, not commercial. We do not run an academic laboratory. We are in business, and although we do some molecule chasing and let a few men have their heads in work along lines in which they might feel inclined to do something, a greater part of our research work is directly applied to the needs of the business, and much of the research work is dictated by our customers or by prospective customers.

Someone will come to us with a problem. Well, the man with the new sandpaper disk, for example. He wanted something that would replace glue because he was having trouble with glue and knew its limitations. I give this only as one of a great many examples. He came to us to try to develop something to replace glue and give a better sandpaper, a sandpaper that would be waterproof and have longer life. We went to work on the problem, gave it to the research laboratory, and they developed resins which had the characteristics necessary to do that particular job, and much of our research work is dictated to us from the outside.

The CHAIRMAN. But it is all planned by a general staff.

Mr. BAEKELAND. All planned directly by the management and not only by the research management; it is also directed by the executive management—sales and executives also have their say in what we are going to do or what we are going to quit working on in research.

The CHAIRMAN. In other words, each person in the research laboratory is told just what his task may be with the exception of a few who are engaged in what you call molecule chasing?

Mr. BAEKELAND. Yes.

The CHAIRMAN. In other words, the phrase that I think Dr. Jewett used here the other day is applicable here. It is cooperative effort under control.

Mr. BAEKELAND. That's it, and the men themselves help each other. They cooperate. Each has something to contribute and those men have meetings together in which they exchange problems. That is the way it works out.

The CHAIRMAN. Of course, since you have been associated with this company and with this industry you have had occasion to observe the work of other laboratories?

Mr. BAEKELAND. Yes.

The CHAIRMAN. And the development of patents generally, have you not?

Mr. BAEKELAND. Yes, sir.

The CHAIRMAN. What could you tell the committee with respect to the position that the research laboratory occupies in the modern field of invention and patents? Have you reached any conclusions about that?

Mr. BAEKELAND. Yes, I have. I was just trying to say it as succinctly as possible, because it is a large subject. The great technical advances that we have witnessed have been the result of research work, either by individuals or by organized research in laboratories of large companies. The advances, the improvements, have been largely, I am convinced, owing to research. New products, new useful things, new ways of doing things, can only come from carefully applied work done in scientific laboratories—improvements in our paints, in our fabrics, in the materials we use such as these.

The CHAIRMAN. In other words, we couldn't make the advances which are being made without the extensive and expensive equipment which is supplied in these large laboratories?

Mr. BAEKELAND. That is true. They are making the advances. No one else is doing it. Without those laboratories, naturally these advances wouldn't be there.

The CHAIRMAN. That is exactly what I am trying to develop. In other words, the collective work of a group of individuals is becoming gradually more important than the individual work of an individual inventor.

Mr. BAEKELAND. That is true.

The CHAIRMAN. And as the frontiers of science are pushed further and further back, it is the collective and cooperative enterprise rather than the enterprise of the individual which is bringing the greatest returns to civilization.

Mr. BAEKELAND. Very likely.

Senator KING. However, the field for the inventive genius of the individual is not narrowed, even by the collective activities to which the chairman has referred.

Mr. BAEKELAND. No, sir. I think that it is increased, because each new development opens new vistas and new avenues that suggest themselves, avenues of approach to the solving of another problem. Our increased knowledge, our increased information as a result of this is giving us more and more hints and suggestions to follow, and the thing I think is cumulative in a geometrical progression rather than an arithmetical progression.

Senator KING. Isn't it true that frequently a basic patent which may have been obtained by this collective energy and collective effort becomes the basis of a large number of improvements which are developed by the inventor in a small way, and as a result of his interpretation of the defects, as there are defects even in basic patents, and he addresses himself to improving the basic patent, and as a result of that many of the patents which are obtained merely cluster around the basic patent.

Mr. BAEKELAND. That is very true. That is particularly apt in this case. That is precisely what happened. My father came out in 1909 with a few patents. Following that he continued his research work, brought about improvements and modifications of those first materials as well as bringing out additional new materials.

Senator KING. Did you give a definition which would be comprehensive as well as detailed of what plastics are, how broad a field they cover?

Mr. BAEKELAND. Well, that is a large order. You see—well, I can read you a list here of some of the industries.

Senator KING. Generally, when you speak of plastics what does the ordinary ignorant man such as myself and others comprehend it to be?

Mr. BAEKELAND. Of course, some of these people call paint and varnish resins plastics. I don't think they are plastics. I think anything that can be shaped by applying pressure to something, squeezing it into shape, is a plastic. A piece of marble, like this marble, is shaped by machinery. That is not a plastic operation. If, on the other hand, these columns had been formed out of a loose unconsolidated material, and under pressure had been formed into that shape there, they would then have had to be a plastic material.

Senator KING. Almost any element, then, that might be congealed, if I may use that expression, might be the basis of plastics. The principal elements, though, are carbon, are they not, and oxygen and nitrogen?

Mr. BAEKELAND. All of these plastics are organic materials and all organic materials contain carbon, and these here, for example.

Here is a urea material. This thing is made out of a base for fertilizer.

Senator KING. I beg your pardon?

Mr. BAEKELAND. This is a urea material made out of the base of a fertilizer. That is an organic material, carbon, nitrogen. Urea is largely used for fertilizer. It is very cheap. It is made from the air and the supply is unlimited.

The CHAIRMAN. The word "plastic" no longer actually covers the field of the articles that you produce. Take that wheel, that gear, for example, that is cut rather than pressed.

Mr. BAEKELAND. Yes, but you see that gear is moulded.

The CHAIRMAN. That is what I was getting at. I understood you to tell me it was cut.

Mr. BAEKELAND. Afterward. When that gear was made it was just as you see it except no teeth were cut into it.

The CHAIRMAN. I see.

Mr. BAEKELAND. And the metal hub was pressed in or moulded in in the original operation, moulded in as a matter of fact. That is a plastic; that was moulded in that shape. So was that box in your hand.

The CHAIRMAN. That is what I conceive to be plastic, anything that is molded.

Mr. BAEKELAND. These are truly plastics. These are cloth coverings made of some of our materials; they are alcohol and oil and water, weather resistant. They have their uses for gas masks and upholstery and raincoats and things of that sort.

The CHAIRMAN. Tell me, is this a substitute for wool?

Mr. BAEKELAND. Oh, no. No; that is not a substitute for wool. We would like to find one, as a matter of fact. I don't think we ever shall.

The CHAIRMAN. Well, you know I have been hearing some rumors of such a substitute. You haven't heard of it?

MR. BAEKELAND. We hear a great many rumors before we actually find one.

THE CHAIRMAN. Now I am asking you a question which I may transmit to some of my constituents. You have not yet seen a substitute for wool as rayon is for silk?

MR. BAEKELAND. No, I have not.

THE CHAIRMAN. Thank God for that. [Laughter.]

MR. BAEKELAND. Speaking of plastics again——

Representative REECE (interposing). If you will permit a digression there, don't the rayon people themselves however make a woolen blanket or blanket to be used in place of a woolen blanket?

THE CHAIRMAN. Well, I am sure that if it hasn't come to the attention of the witness it is not worth much. [Laughter.]

Representative REECE. I would be glad to have you come down home and look.

MR. DIENNER. Mr. B. ekeland, what is the latest development which would be rather unusual in regard to your industry, with regard to your company which you could tell us about?

MR. BAEKELAND. There are a great number of them; there is one perhaps more spectacular than some of the others. Using our materials (we take no credit for this development, we have been merely supplying materials for it and in a small way helping—I want to repeat that we don't take credit for the thing) it is possible, in fact it is being done, to produce an airplane wing or an airplane fuselage on a cycle of every 2 hours with rather simple and inexpensive equipment. It is a material which the Bureau of Standards shows has a strength weight ratio greater than any of the materials employed at the present time. You can well imagine what that means in production of aircraft. Whereas jigs and tools and a lot of expensive equipment would take a long time to build, that is now unnecessary to make. The separate units that go into the construction of a wing or a fuselage can now be eliminated. The great period of time required for assembling is over, simply by use of plastics in combination with some other materials. An airplane fuselage, an airplane wing, can be turned out every 2 hours with one piece of equipment.

THE CHAIRMAN. You said a wing or a fuselage.

MR. BAEKELAND. Yes; or both.

THE CHAIRMAN. Could you turn them out together?

MR. BAEKELAND. They are made separately, they are made on a different form, a different mold, but it takes the same amount of time for a wing as for a fuselage. When that shell has been made, adding merely the internal bracing, models can be very quickly changed in case of war, or in commerce. When a model becomes obsolete or less desirable a new one can readily be made; without very much delay and with very little cost you can make the change.

THE CHAIRMAN. Is this method being used?

MR. BAEKELAND. Experimentally only. It is being tested, it is under observation; yes, it is coming.

THE CHAIRMAN. Is it your judgment that it is beyond the experimental stage? I mean there is no question in your mind of its utility?

MR. BAEKELAND. That is true.

THE CHAIRMAN. Have the airplane manufacturers been advised of it?

MR. BAEKELAND. This is still very new. There are rumors about it.

THE CHAIRMAN. Is that method covered by a special patent?

Mr. BAEKELAND. There are patents applied for on the method, not by us, but by the people with whom we have been working.

Mr. PEOPLES. Mr. Chairman, I take it, it has been called to the attention of the air forces of both the Army and the Navy.

Mr. BAEKELAND. Oh, yes; they are well aware of it and as a matter of fact I have been given permission to mention this thing today or I shouldn't have done so.

The CHAIRMAN. These applications have been made by citizens of the United States?

Mr. BAEKELAND. Oh, yes.

Senator KING. Does this fuselage take the place in all of its parts of aluminum or magnesium. There is a magnesium alloy which is stronger and lighter, as I remember, than aluminum.

Mr. BAEKELAND. You couldn't make a magnesium airplane, wing and fuselage, in 2 hours with 9 men.

Senator KING. What I mean is so far as the durability is concerned.

Mr. BAEKELAND. The durability is far greater.

Senator KING. Than the metal?

Mr. BAEKELAND. Oh, yes. You see the metal has fatigue, for one thing, it crystallizes and has flaws; its strength ratio is lower than this material, and there is great fabrication cost, there is trouble with all these metal things in an airplane. Each of these metal parts—there are a great number of them—are assembled, each is shaped, machined and drilled and milled and then assembled with nuts and bolts and rivets and one thing and another, and as a matter of fact the absence of rivets in these planes has shown an increase of 35 miles an hour, just by cutting out skin friction, the resistance of the air to the rivets. There is an increased speed of the planes under test of 35 miles an hour.

Senator KING. Then the utilization of these products to which you have just referred would supersede the present method of constructing fuselages and other parts?

Mr. BAEKELAND. It would simplify it a great deal.

Senator KING. Of course you haven't as yet succeeded in manufacturing something that would take the place of the steel for the engine?

Mr. BAEKELAND. Oh, no, no, this is just the wing and the fuselage.

The CHAIRMAN. Give him a chance, Senator.

Mr. BAEKELAND. They will still make the engine the same way.

Senator KING. The Senator was afraid you might intrude on the sheep. I don't want you to intrude upon the iron ore mines.

Mr. BAEKELAND. I don't think it is going to intrude on that.

Representative REECE. What is its resistance to vibration?

Mr. BAEKELAND. It has a high fatigue resistance, and it is weather resistant so that only a color coat, not a protective coat, has to be put on, and you would be amazed how much these airplane designers worry about a coat of paint on a plane, the added weight.

The CHAIRMAN. Is the absence of the bolt the only factor which tends to increase the speed?

Mr. BAEKELAND. The rivets?

The CHAIRMAN. The rivets and nuts.

Mr. BAEKELAND. Yes; that is the only thing.

The CHAIRMAN. The material itself has no effect on speed?

Mr. BAEKELAND. No; it is a perfectly smooth surface rather than a riveted surface. Now the same method can be applied to the

manufacture of small boats and other forms of that kind which are now made of wood or metal, or some other substance, where you have an assembly cost which is high and where it takes quite a while to build one. It is very easy to build a boat, or something of that sort; I don't mean a big ship but I am talking about small boats of which there are a great many made.

The CHAIRMAN. And it would tend, I suppose, to reduce the cost materially.

Mr. BAEKELAND. Oh, very materially reduce the cost, and the time of manufacture. That would be the great advantage of this thing for the aircraft, they are so costly and they take so long to make. I was reading in the paper only the other day that the British last summer ordered 500 planes from Douglass, and the first one was delivered the other day and the rest will be delivered through the year, the next 12 months. They have 18 months to deliver 500 planes—a big airplane manufacturer.

Now you can figure out if they were in a hurry and had to do it in wartime, they could set up a whole number of these forms, molds, they are not very expensive, but suppose they had only 1 for the wing and 1 for the fuselage, they could turn out 10 planes a day.

The CHAIRMAN. It is obvious then that there would have to be a very material increase in the number of planes in use if this method were brought into general practice to provide employment for the artisans and the mechanics who are now working to produce the planes such as the British Government ordered.

Mr. BAEKELAND. Yes; but there is a great shortage of those mechanics. There is a dearth of them now, and it has recently been suggested by the administration that means should be provided to apprentice men to become mechanics of this kind, on account of their great shortage.

The CHAIRMAN. So that by and large it is still your judgment that this development would not create unemployment, it would mean more work rather than less.

Mr. BAEKELAND. I do believe so.

Senator KING. It may not be germane, but do you know whether the Germans or the French—you have adverted to that—utilize this method?

Mr. BAEKELAND. No; on the best information I have they have not used it. It has been developed in this country by an Army officer.

Senator KING. Notwithstanding the high praise we give to the German chemists and technological investigators, we still wear the crown of primacy, don't we?

Mr. BAEKELAND. I think so, and I think we do in the field of chemistry. Our chemical industry has made tremendous advances since 1920. It has resulted from the protective tariff which was established at that time which permitted people to go into the manufacture of chemicals in competition with the Germans, and as soon as our manufacturers set up research laboratories, they made great advances in chemistry, and have since that time.

It might interest the committee—this perhaps is not germane to the subject—that we, the Bakelite Corporation, can buy the materials that we use, though very heavily protected by tariff, more cheaply than any of the European or foreign companies with which we are affiliated.

Senator KING. You mean to say the American manufacturer of those materials can produce them cheaper than they could abroad?

Mr. BAEKELAND. Very considerably so.

Senator KING. So the tariff really doesn't give protection.

Mr. BAEKELAND. The tariff isn't necessary, but the tariff made that possible.

Senator KING. That was largely for the coal-tar products.

Mr. BAEKELAND. Yes; that is what started it. But you see when a chemical company got into coal tars it went into other things, too.

Senator KING. Dyes?

Mr. BAEKELAND. Dyes, and one thing led to another, and we are in a more favorable position in this country with respect to our raw materials than any of our foreign affiliates.

Senator KING. You are not afraid of foreign competition along these chemical developments?

Mr. BAEKELAND. No; competition from abroad I think is not very likely.

Representative WILLIAMS. Do I understand you to say, Mr. Baeke-land, that this gear that you have here, or similar gears to that, is in general use in automobiles at the present time?

Mr. BAEKELAND. And has been for many years.

Representative WILLIAMS. And in general use in machinery in various plants throughout the country?

Mr. BAEKELAND. Yes; those gears are used as timing gears in the motor, not as transmission gears. They are not strong enough to carry the power load that is on a transmission gear.

Representative WILLIAMS. That gear has supplanted, of course, steel.

Mr. BAEKELAND. Yes; it has.

Representative WILLIAMS. What is the relative basic cost of the production of that wheel compared with a steel wheel?

Mr. BAEKELAND. I don't think there is much difference; about the same. I don't know what the relative costs are, but I should guess that they are very much the same.

Representative WILLIAMS. And this is as durable or more so than the steel?

Mr. BAEKELAND. Yes. You know, if two substances or two materials of the same kind work and wear against each other they wear out faster than if two different substances work against each other. That is the reason for bronze and lead babbitt bearings on steel shafts. This same principle applies here. One of those Bakelite phenolic resin gears running against a steel gear will give greater wear than two steel gears running against each other, or two gears of that kind running against each other; and this gear has no ring to it. It deadens the sound and it is used to keep the gears running silently. Where those gears are not used, then silent chains are used, these wide link chains.

I am not certain of the figures, but I know 3 or 4 years ago 65 percent of the cars made had those gears in them.

Representative WILLIAMS. I understood your capital structure is now about 8½ million dollars.

Mr. BAEKELAND. Yes.

Representative WILLIAMS. What were your gross sales, say, in '38 or '37?

Mr. BAEKELAND. Our competitors would dearly love to have us tell them that. If it isn't necessary, I should rather not shout it out in open meeting.

Senator KING. Are your sales increasing?

Mr. BAEKELAND. They go up and down. In the last few years they haven't been so good. Business hasn't been very good and it has been more difficult than in the past. Our business has been a spectacular one, perhaps the product and the development of the products has been a bit dramatic, and their wide use I think has led people to exaggerate the importance of our business and its size. The mistake, if a mistake is made, is one of exaggeration of our size and importance, as far as sales are concerned.

Representative WILLIAMS. It has been a business of very rapid growth during the time it has been in operation.

Mr. BAEKELAND. It has been a gradual growth. It has not been very rapid; it has been gradual. We have been in business for 28 years.

Representative WILLIAMS. And have grown from a capital structure of \$28,000 to \$8,500,000.

Mr. BAEKELAND. We could have kept the same capitalization today.

Representative WILLIAMS. And in the meantime I assume you have paid reasonable dividends.

Mr. BAEKELAND. Oh, yes; but our dividend policy has been a conservative one. We have declared about 50 percent of our earnings in dividends, and the rest have been put back into plant and research and put aside for a rainy day. Of course, these new tax laws just made that impossible. We went through a long depression where we cut into our savings, into our surplus, to carry our people through this last depression. We didn't fire our people, and all that sort of thing. We kept our people, and if we had to lay off some workmen, we took them back again. People don't leave us; we don't have a turn-over; we don't get resignations, and our competitors don't take them away from us. We are a happy family there. One reason we are a happy family is because we are loyal to them and they are loyal to us. We treat them well and we have carried them. That was expensive.

We also built this \$4,500,000 plant during the depression and that ate into our savings, and we have had years when we haven't had many profits. Then these new products come along and each time a new product comes along it is like going into a new business; it means we have to build additional plants and equipment in order to go into production, because our other equipment isn't suited to its manufacture. When we come out with a new product, it means an increase in the sales department, and those things have taken our money.

Representative WILLIAMS. Were they very highly specialized?

Mr. BAEKELAND. They are unskilled labor but we train them into skilled or semiskilled for our particular purposes. I mean they know their jobs, yes. Now we have had to curtail; there are things we would like to do, products we would like to make we are not going ahead with today, because—well, these tax laws.

Senator KING. Lack of capital, is that it?

Mr. BAEKELAND. We are afraid to take a chance on involving any more of our capital and our surplus in the plant so we could begin to

build it up again; after going through the last depression it has been rather hard on savings and then, as I say, a four and a half million dollar new plant besides.

Representative WILLIAMS. Is the stock in your corporation widely held?

Mr. BAEKELAND. No, it is not; there are not very many stockholders.

Representative WILLIAMS. Rather closely held?

Mr. BAEKELAND. You see, my father started with some friends, invited some friends to come in with him, and there has not been any large increase in stockholding.

The CHAIRMAN. You have testified, I think, at the beginning that it was not necessary to borrow any money?

Mr. BAEKELAND. No.

The CHAIRMAN. Either by way of bank loans or by way of bond issue?

Mr. BAEKELAND. Or stock issues except the original 250,000. I think that was the figure. I am not sure, but I believe that was the figure.

Dr. LUBIN. Mr. Baekeland, if I understand you correctly, you do not make any of these products; you only make the raw materials out of which these products are made?

Mr. BAEKELAND. That is correct, Dr. Lubin. Our customers make those products.

Dr. LUBIN. Now you have competitors like Catalin and others; do you not?

Mr. BAEKELAND. Yes.

Dr. LUBIN. Do they have patents?

Mr. BAEKELAND. They have.

Dr. LUBIN. Is their business built up?

Mr. BAEKELAND. They have some patents. This plastics business, though, except in certain branches of it, is not very much restricted with patents today. Our basic patents expired in 1926.

Dr. LUBIN. In other words, then, the use of these plastics in new forms and developing new arts, as it were, grows out of the possibility of using new material to do something that was formerly made out of something else, irrespective of patents; is that so?

Mr. BAEKELAND. It might have been made out of something else, and it might not have been made at all before, because these materials make it possible to make things which before had not been made, and in other cases it might have been made out of something else. Now for example, here is a switch plate. If that switch plate has been made out of brass, what happens? It looked quite nice when you bought it, and then the dirty thing got all tarnished, black and nasty, and in cold weather you walk across the rug and get a nice shock from the brass. Well, this thing here is cheaper than the brass and it is better than the brass, and never tarnishes. If you want a white color you have got it. Now, in that way it replaces brass, but in other respects it gives you what brass never gave you before.

Dr. LUBIN. And in addition you can buy it at Woolworth's where you could not buy the brass ones before. Here is a raw material that you have developed. Now, the use of that raw material, its entry into the arts, is entirely independent of any patent system of any sort? I mean if I conceived the idea of building something and

I find that I can build it more cheaply with your raw materials than I can out of steel or wood, or something else, or that through this raw material I can make something that otherwise could not be made——

Mr. BAEKELAND (interposing). Or better; often it is because it is better.

Dr. LUBIN. ——I am in a position to take advantage of that and the public gets that advantage?

Mr. BAEKELAND. Yes.

Dr. LUBIN. What I am trying to get at is the whole question as to how far this development might have taken place. Somebody discovers a plastic. I find that I can use that plastic in making something and I would do it irrespective of the existence of a patent, would I not?

Mr. BAEKELAND. I think I lost the trend of your question. You would have what?

Dr. LUBIN. I would have used your plastic, irrespective of the existence of a patent system. If I know of the existence of a raw material that I might use, I would use it if I could produce my product more cheaply with your raw material than I can with somebody else's?

Mr. BAEKELAND. Yes.

Dr. LUBIN. Consequently, even though there had been no patent system and somebody conceived the idea of a plastic, plastics would have entered into the arts, would they not?

Mr. BAEKELAND. But you would not have had all these things without a patent system to protect them.

Dr. LUBIN. There is no patent system protecting this device or this device?

Mr. BAEKELAND. Not today, but it took a lot of work and a lot of expense and a lot of risk to introduce those things. You would be amazed how much trouble we had to get that thing into use in the telephone company, or that for a radio cabinet. It is not as easy as all that. Now there have been years of development work and sales effort and introductory effort.

The CHAIRMAN. If you told Dr. Lubin what the original patent was, that would answer the question that he has in mind, and how the industry was built up in relation to the patents which were received.

Mr. BAEKELAND. Yes; the industry was built up.

The CHAIRMAN. Can you just illustrate that to us briefly?

Mr. BAEKELAND. Well, of course having patents, having protection, the industry——

The CHAIRMAN. The point is this, how much of this industry that you have been describing to us this afternoon is based upon the patent system and how much of it could have been developed without the use of a patent at all?

Mr. BAEKELAND. Every bit of it under patent system, every one of these materials. Their modifications have all been patented.

The CHAIRMAN. But some of those patents have now expired?

Mr. BAEKELAND. Oh, that is true.

The CHAIRMAN. The basic patents are expired. So you are telling the committee the industry is a direct result of patented devices?

Mr. BAEKELAND. Precisely.

Senator KING. And the public now are getting the benefit of those patent devices because of the expiration of the patent?

Mr. BAEKELAND. Certainly.

Senator KING. But you built up the industry under the patent system?

Mr. BAEKELAND. We did.

Dr. LUBIN. What I am trying to get at is whether you might not have built up the industry without the patent system. I am not convinced.

Mr. BAEKELAND. I certainly am.

Mr. DIENNER. Dr. Lubin, it may be you fail to appreciate the point that those materials or those devices that you have there require certain raw materials to be prepared and that you cannot walk out into the open market and in a drug store buy raw materials. The raw material which you must mold is the subject matter of the patents that Dr. Baekeland took out.

Mr. DIENNER. Now it would not have been possible for you to get the materials unless someone had supplies the materials and that is where Dr. Baekeland's patents and his industry come in.

Dr. LUBIN. My contention is that Mr. Baekeland's father had developed this new material and it became known to industry that such a material was available; they should use it and he produce it, whether or not there were patents if he could make it and industry wanted it?

LACK OF INCENTIVE TO INVENT WITHOUT PATENT PROTECTION

Mr. BAEKELAND. Well, now, Dr. Lubin, when he invented this it was the basis of this industry. It required a great deal of work to bring it to a point where it could be commercially utilized. He spent his own money on it in the early days, before the company was formed, and then with his own money and that of others he conducted research work; profits came in; they were put back into the business; more research work, development, more introductory work. He would not have gone ahead with that if he had not been protected because anybody could have come along and copied him. Who would have had to amortize the expense that he went to, the money he spent on research, in equipment that did not work and had to be junked, and other materials tried? And all that sort of thing. People don't go ahead without an incentive.

The CHAIRMAN. There would have been no motive for the development of the industry if there had not been a patent system? Your father would have found himself in precisely the position of the gentleman who left the stand just before you took the seat, who has been unable to find any person who is willing to manufacture an apparently useful device which he exhibited to the members of the committee because he cannot offer any patent protection?

Mr. BAEKELAND. Exactly, and there would not have been the continuing development. Now what this did for him, this patent system enabled him to build up a glass wall around himself, behind which he could work in security without being rushed and through which the public on the outside could peer in and see what he was doing, and wait until 17 years when they knocked the walls down and everybody could then come in. Now that is all that it did. It gave him a chance to work and develop, to improve and to do the things that a research worker does.

Dr. LUBIN. Perhaps I can clarify what I have in mind better by adding this question. In your research laboratories do you work only on the development of new materials or the improvement of existing materials, or do you also work on the possible uses of existing materials?

Mr. BAEKELAND. Yes; we work on those, and then we run into an anomaly when is a patent not a patent, or when is a patent monopoly not a patent monopoly? I will tell you how that is.

Suppose we developed, suppose we had taken out a patent on this adhesive tape. On this adhesive tape, incidentally, a patent was applied for. It is coated with one of our materials and what it produces is an adhesive tape that you can keep on for weeks, and go in swimming twice a day, and it doesn't come off or come loose. You can wash it right off; dirt doesn't stick to it. It has certain advantages.

We developed the material. We did not develop the adhesive tape. We turned it over to an adhesive tape manufacturer who came to us wanting this kind of coating. He applied for the patent.

Suppose we had applied for that patent, or taken out a patent on adhesive tape. The law doesn't permit us to issue a license to an adhesive tape manufacturer under the patent with the proviso that he must buy his material from us. That is against the antitrust laws. So what we have to do in those cases is to give the dear old customer the right to use the patent and hope that we can get our share of the business with our competitors.

We are not manufacturers of adhesive tape. We are not in the patent licensing business, and although in theory we could license him and collect a royalty and sell him material, it doesn't work that way. When a man pays you a royalty he thinks he has given you enough, and if he is going to buy materials, he is going to do that from your competitor. He says, "Those fellows get enough from us on a royalty, and I'll be darned if I'll buy material from them too."

Dr. LUBIN. Here you have these laboratories, people working, finding new uses for existing materials upon which patents have expired. Despite the fact that you have no patent protection you go ahead and develop new uses for your materials.

Mr. BAEKELAND. Because they are added outlets for our materials. But if we didn't have the materials to fill the needs and use, we wouldn't be bothered with developing a use patent.

Dr. LUBIN. What I am getting at is, you can develop a new use for a certain product you have on which there is no patent, and your competitor can make exactly the same thing tomorrow once they have discovered it, yet you continue to produce these new things, despite the fact that your competitor can produce them immediately thereafter.

Mr. BAEKELAND. You mean in the case of a use patent?

Dr. LUBIN. You use your product in making these. Assuming now that the product out of which this is made—your research laboratory develops this, but you don't make them, other people make them.

Mr. BAEKELAND. We didn't develop the switch plate.

Dr. LUBIN. I mean you do, in your laboratory, seek new uses for materials upon which patents have expired.

Mr. BAEKELAND. That is true.

Dr. LUBIN. Despite the fact that you have no patent protection and despite the fact that tomorrow, once you have found a new use

for your product, anybody can go out and make that product, just as you do.

Mr. BAEKELAND. Yes. If we run across it accidentally, yes; but we don't put our men to work on something like that. We would rather put them to work on something that is protected.

The CHAIRMAN. To what extent are the materials which your father and your company have developed, and upon which the patents have expired, being used now by competitors?

Mr. BAEKELAND. Widely.

The CHAIRMAN. That is the point, I think, the doctor was trying to develop.

Mr. BAEKELAND. These materials on which patents expired—

The CHAIRMAN (interposing). Your counsel is making applications for patents which are really improvements upon the basic patents?

Mr. BAEKELAND. Yes; that is true too, but we hold our own in the field where the patents are expired through service to our customers.

The CHAIRMAN. Then it comes down to what in the trade is called the "know how" and the reputation and the goodwill.

Mr. BAEKELAND. It is more than that. We give almost a professional service. Our customers are in constant touch with our sales engineers. They are not salesmen who go out and take orders.

Let us assume you are ready to go into business to make hardware. You are a hardware manufacturer and you want to make this kind of hardware. You don't know anything about the technic or anything of the sort. Our people will lay out a plant for you, specify optional equipment, recommend certain equipment for you to put in there. We will go so far as to try to get you personnel for a skeleton organization of that kind and get you started.

The CHAIRMAN. Yes; you endeavor to render an efficient service.

Mr. BAEKELAND. An engineering service.

The CHAIRMAN. But there is nothing in the patent system or in any other system which prevents competitors of yours from using the materials upon which your patents have expired?

Mr. BAEKELAND. None whatever.

The CHAIRMAN. I think that is what Dr. Lubin had in mind.

Senator KING. In your research work do you discover new elements, if I may use that expression, and get a patent upon that new discovery? Perhaps the new element or the new product would be the result of a rearrangement of the molecules or the atoms of the various compounds out of which the product is made.

Now, do you find, in your investigations and in your researches, that you discover new processes which would permit you to obtain inventions for plastics?

Mr. BAEKELAND. We do; yes.

Senator KING. And upon those new inventions and new discoveries out of the same elements you get patents?

Mr. BAEKELAND. Yes; and frequently our older materials are in competition with the new, or some other material might be in competition with it.

The CHAIRMAN. You find yourself putting yourself out of business as you go along.

Mr. BAEKELAND. Sometimes we do, and then there are substitute materials that can be used, too, where it is a matter of choice, and we

have to try to convince the customer that the new material is better than what he is accustomed to using.

Mr. PATTERSON. Mr. Baekeland, your father started the plastic business?

Mr. BAEKELAND. The plastics industry in this country with the exception, I should say, of celluloid, which is cellulose nitrate, gun cotton, invented by Hyatt. He was endeavoring to develop a billiard ball material which would be a substitute for ivory, and he invented celluloid. That was the first synthetic plastic, but its field, you know, is limited.

Mr. PATTERSON. Are not 95 percent of the buttons men wear on their clothes plastic, or some very high percent?

Mr. BAEKELAND. It is increasing.

Mr. PATTERSON. To what proportion would you say that the plastic industry has grown—60 million per annum, 80 million per annum, or have you an idea?

Mr. BAEKELAND. The Department of Commerce has those figures.

Mr. PATTERSON. I don't have them.

Mr. BAEKELAND. I don't have them in my head; no.

Mr. PATTERSON. I want to ask you one other question. Some time ago you spoke of airplanes and plastic wings. Can you speculate as to whether these new planes might meet the administration's much discussed problem of having adequate facilities for mass production in case of need?

Mr. BAEKELAND. Yes; it would do so admirably.

Mr. PATTERSON. And what is the comparison of the length of time it might take to make a plastic wing over the other type of wing?

Mr. BAEKELAND. Well, I will have to guess at that.

Mr. PATTERSON. I won't ask, you to do that. I don't want to press you.

Mr. BAEKELAND. It would be many times the amount of time; oh, I should say it would be 20 or 30 times.

Mr. PATTERSON. More difficult?

Mr. BAEKELAND. As long to make the other.

Mr. PATTERSON. To make the present wing.

Also is anyone ready to go into commercial production of these wings?

Mr. BAEKELAND. The plant has been designed, and production awaits a contract which is pending.

Mr. PATTERSON. Is there an invention of this plastic wing, any one man responsible for it?

Mr. BAEKELAND. Yes, Colonel Clark.

Mr. PATTERSON. Colonel Clark?

Mr. BAEKELAND. Formerly of the United States Air Service.

Mr. PATTERSON. An ex-Army man?

Mr. BAEKELAND. He is the man who developed the thing, and he got a backer to support him on his development work, and that development work was carried out by one of our customers, the Haskelite Co., of Grand Rapids, Mich.

Mr. PATTERSON. What is Colonel Clark's first name?

Mr. BAEKELAND. I might have it here in a letter. I think he was in command of Wright Field, at Dayton, and he is the man who developed the Clark Y-section wing, which is widely used. He is one of the ablest and foremost technicians of airplane design.

Representative REECE. Have you explored the possibilities for this material in the building supply industry?

Mr. BAEKELAND. Yes, sir. There is quite a little work being done in that field. Here is a piece of plywood. That is made up of a number of pieces of veneer welded together with this material here which is a bakelite plywood bond. Those sheets are established in between the layers of veneer, the whole is pressed together warm, and it makes a water-resistant, weather-proof ply.

The CHAIRMAN. The material that you supply there is the bond.

Mr. BAEKELAND. That is the bond.

The CHAIRMAN. The veneer is wood.

Mr. BAEKELAND. Wood. The first plywoods were made with animal and vegetable glues, which are water soluble, and as soon as the plywood goes out-of-doors and gets in the weather it splits and comes apart. This plywood here is usable under water. Anthony Fokker built a new 110-foot triple-screw yacht out of that material. Even his engine beds were made of it, and he has three 1,000-horsepower motors. He had built plywood airplanes; he knew the value of plywood; he knew its strength. He is perhaps as well versed in the use and limitations of plywood as anybody I know. He had the courage of his convictions and he built this expensive, large yacht entirely out of those materials.

The CHAIRMAN. Are there any other questions?

SEARCH FOR SUPPRESSED PATENT UNSUCCESSFUL

Mr. DIENNER. I have one more question. Do you know of any patent which is being suppressed?

Mr. BAEKELAND. No; I don't, Mr. Dienner. I don't know of one, and as it is interesting, I might tell you that Mr. Parsons, who is Secretary of the American Chemical Society—the American Chemical Society is quite an organization, it has a large membership, it runs into the thousands—was aware of the fact that some people believed that patents were being suppressed and that perhaps they were right, so he circularized the membership of the American Chemical Society and asked the membership to submit to him cases of a suppressed patent. He didn't get a single example. I can't conceive of a patent being suppressed. I don't know why anyone should suppress a patent when he could use it.

Senator KING. Don't some inventors claim a suppression of patents because after bringing them to the attention of manufacturers or persons engaged in a particular industry they didn't see fit to utilize them and the inventor then claimed that they were suppressed? Perhaps the person to whom he exhibited them had better patents or at any rate felt that there was no necessity of utilizing this because it would not add to the success of the products which they were giving to the public.

Mr. BAEKELAND. I can conceive of an inventor that you might say was perhaps a bit of a sorehead or whose vanity was hurt because he had sold someone a patent and that patent wasn't outwardly used. For example, suppose that Mr. Graham here had bought a patent on an article that wasn't commercial and wasn't useful, but a patent which was valid and had not expired, one feature of which might remotely bear upon his biscuit maker. The patent might have been

taken out to something very remote to biscuit making, but it had one claim in it that covered the point that he brought up here. He might have bought that patent so as to be covered on that one particular point. The inventor might have looked upon it as a suppression of his patent because the patent might have called for—I don't know what it might have been, it might have been a perfectly useless object but had one claim which bore upon this particular baker. Now the inventor might through some reasoning say, "Well, my patent was suppressed." Mr. Graham might never have had any intention, desire, or hope of commercializing the article on which that patent bore. That possibly, you might reason, was a suppressed patent; there may be some cases of that kind. I know of none: I know of no valid, real case of a suppressed patent.

APPROVAL OF PROPOSED SINGLE COURT OF PATENT APPEALS¹

Mr. DIENNER. One more question. Are you familiar with the proposal for a single court of patent appeals in the system, and what are your views on that, briefly?

Mr. BAEKELAND. I think it would be an excellent thing if we had a single court of patent appeals, a court composed of several justices who were technically trained, because as scientific inventions and discoveries become more complex it is even difficult for technicians within the field to follow some of these things, and it is wholly unfair to expect the judge to be able to pick his way through a mass of technical detail and facts presented in a patent case. Even technicians within the field themselves are sometimes at a loss, experts in patents are sometimes at a loss to follow what is going on. Much that is brought up in a patent suit is new, it is novel, or it wouldn't be the subject of a patent. The more we could have patent suits conducted or judged upon by men who are competent to judge technical situations I think the better will be our decisions in the patent cases. A Federal judge told me that it was terribly bewildering to him to try to fathom his way through one of these cases, and I can readily understand it, so that if we had a court composed of, say, three judges who had been patent attorneys, men who were trained, say, one in electricity, one in chemistry, who at least knew the terms that were used and could refer to the literature, or anything of the sort, to bring themselves up to date on the point in question, it would be a great help; or we could have a court with permanent paid experts, technical experts, whose sole function was to aid the court, not men who were brought in from the outside from time to time, but men who had permanent positions and were properly paid. That would also be a great help, but I think those men should be subject to cross-examination by attorneys in the case.

Mr. DIENNER. Mr. Chairman, this is our last witness that we wish to call, and I shall now turn the proceedings back to you and to Secretary Patterson.

The CHAIRMAN. Mr. Baekeland, I think I can say for the committee and certainly I say for myself that I feel my education has been very much advanced this afternoon. We are very much indebted to you for a very illuminating statement.

Mr. PATTERSON. Mr. Chairman, I should like to call upon Mr. Coe, the Commissioner of Patents, to make a closing statement on our patent situation.

¹ For previous discussion of the proposed court, see p. 900 et seq. and p. 906 et seq.

The CHAIRMAN. We will be very glad indeed to hear him.

(The witness, Mr. Baekeland, was excused.)

Mr. COE. Mr. Chairman, on behalf of Secretary Patterson and myself I wish to state that, with the testimony just offered, the oral evidence in respect to the part played by the patent system in our industrial organism is concluded. I regret that we have had insufficient time to offer to you the testimony of additional witnesses who have been here and were prepared to take the stand. However, their testimony would have been to a large extent cumulative, and for that reason we do not regard it necessary to prolong the hearing.

By providing for the expression of the views of some of those making use of the patent system—inventors and manufacturers, large and small—we have sought to give a fair and objective, though necessarily incomplete, portrayal of the system in operation. It is our hope that we have assisted you in appraising the actual importance and the potentialities of the system in our national economy.

In the statement made to you by the Commissioner of Patents we have identified certain abuses which exist in the system, in our judgment, and have proposed remedies for them. The studies which have prompted the presentation of these facts and recommendations will not, of course, be abandoned with their submission to your committee. Both the Department of Commerce and the Patent Office will continue their study of the patent system and their efforts to improve it still further.

These hearings on the patent system have stirred widespread interest in the subject, and, we are persuaded, will result in beneficial action. For all of these reasons, Mr. Chairman, we wish to record our gratefulness to the committee, our appreciation of the cooperative and frank attitude shown by the witnesses, and the valuable assistance of the able counsel who have conducted the hearings for us.

Senator KING. I would like to ask this question. I recall the recommendations which were made with respect to procedural matters. I suggest that it might be of advantage to the committee; I am sure it would be to me, if those recommendations were put into concrete form, in the shape of amendments to the existing law, so that we could consider them at the conclusion of the testimony in the event that the committee should decide that the patent law should be amended, particularly the procedural features. The measures which would be drafted pursuant to those recommendations I am sure would be helpful.

Mr. PATTERSON. As part of the record, Senator King?

Senator KING. Oh, no.

Mr. COE. Senator, I might assure you of our wholehearted cooperation in that respect.

The CHAIRMAN. The committee is very much indebted to the Department of Commerce for this presentation, and we also thank Mr. Dienner and his staff.

Mr. DIENNER. I appreciate that very much, sir.

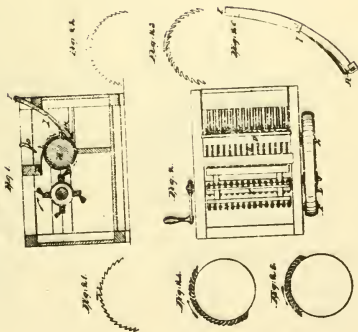
The CHAIRMAN. The committee will stand in recess, subject to the call of the chair.

(Whereupon, at 4:40 p. m., an adjournment was taken subject to the call of the chairman.)

E. Whitney.

Cotton Gin

Patented Mar. 14, 1794.



THE COTTON GIN

THIS MACHINE BY REPLACING THE SLOW CLEANING OF SEEDS FROM COTTON BY HAND LABOR, MADE POSSIBLE THE GREAT COTTON TEXTILE INDUSTRY. WITHOUT IT, SUFFICIENT COTTON COULD NOT BE CLEANED TO SUPPLY THE ENORMOUS DEMAND.

1937-38

GINNERIES
12,800

BALES GINNED
18,252,000

WAGE EARNERS
75,000

APPENDIX

EXHIBIT No. 164

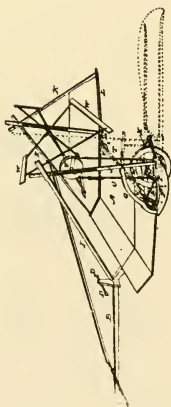
C. H. McCORMICK
Reaper.

Patented June 21, 1884.

1937

UNITS PRODUCED
80,000

VALUE
\$30,000,000



*Reaper
for the West*

THE REAPER

MADE THE VAST FIELDS OF THE WEST AVAILABLE FOR FULL PRODUCTION, MULTIPLIED MAN POWER TWENTY-FOLD, AND ASSURED A SUFFICIENT SUPPLY OF CEREALS FOR THE WORLD'S NEEDS. THERE ARE NOT ANYWHERE NEAR ENOUGH MEN AVAILABLE IN THE COUNTRY TO HARVEST GRAIN CROPS WITH HAND IMPLEMENTS

EXHIBIT No. 165

S. F. & MOASE.

Telegraph Signs.

No. 1647.

Patented June 20, 1940

Example 1st

First Name	Age	Sex	Height	Weight	Time	Place
1	18	M	5' 10"	160	1:10	1
2	18	M	5' 10"	160	1:10	2
3	18	M	5' 10"	160	1:10	3
4	18	M	5' 10"	160	1:10	4
5	18	M	5' 10"	160	1:10	5
6	18	M	5' 10"	160	1:10	6
7	18	M	5' 10"	160	1:10	7
8	18	M	5' 10"	160	1:10	8
9	18	M	5' 10"	160	1:10	9
10	18	M	5' 10"	160	1:10	10

Example 2nd For Compound Minerals
Showing the minerals combined together

First round	2nd round	3rd round	4th round	5th round	6th round	7th round	8th round	9th round	10th round	11th round	12th round	13th round	14th round	15th round	16th round	17th round	18th round	19th round	20th round	21st round	22nd round	23rd round	24th round	25th round	26th round	27th round	28th round	29th round	30th round	31st round	32nd round	33rd round	34th round	35th round	36th round	37th round	38th round	39th round	40th round	41st round	42nd round	43rd round	44th round	45th round	46th round	47th round	48th round	49th round	50th round	51st round	52nd round	53rd round	54th round	55th round	56th round	57th round	58th round	59th round	60th round	61st round	62nd round	63rd round	64th round	65th round	66th round	67th round	68th round	69th round	70th round	71st round	72nd round	73rd round	74th round	75th round	76th round	77th round	78th round	79th round	80th round	81st round	82nd round	83rd round	84th round	85th round	86th round	87th round	88th round	89th round	90th round	91st round	92nd round	93rd round	94th round	95th round	96th round	97th round	98th round	99th round	100th round
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100

The System of Trees

	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
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Example 4.9

Fig. 1

1st & 2nd moments


1	2	3	4	5	6	7	8	9	C
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Example 5

a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s	t	u	v	w	x	y	z
---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---

Fig. 1





62

THE TELEGRAPH

COMMERCIAL. INSTANTANEOUS TRANSMISSION
LINKING TOGETHER IN WIDE KNOWLEDGE

VENTS NOT ONLY INDIVIDUALS BUT ALL
AND PEOPLES OF THE WORLD

1937

WAGE EARNERS
70.000

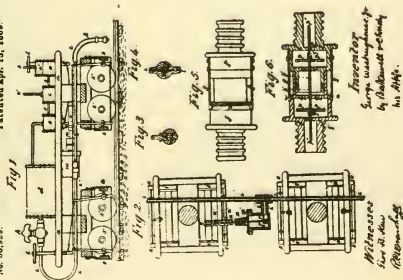
WAGES PAID
\$83,748,000

TOTAL INVESTMENT
\$507,000,000

THE TELEGRAPH

ORIGINATED ELECTRICAL COMMUNICATION AND LARGE-SCALE COMMERCIAL, INSTANTANEOUS TRANSMISSION OF INTELLIGENCE, LINKING TOGETHER IN WIDE KNOWLEDGE OF CURRENT EVENTS NOT ONLY INDIVIDUALS BUT ALL THE COUNTRIES AND PEOPLES OF THE WORLD.

G. WESTINGHOUSE, JR.
STEAM POWER BRAKE.
No. 88,929. Patented Apr. 13, 1869.



STATISTICS NOT AVAILABLE

THE AIR BRAKE.

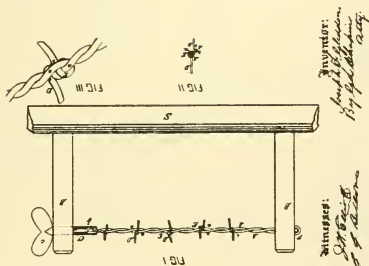
IT HAS MADE POSSIBLE THE SAFE SPEEDING UP AND LENGTHENING OF TRAINS. THUS CHEAPENING TRANSPORTATION AND MAKING IT EFFECTIVE FOR THE WORLD'S REQUIREMENTS. WERE IT NOT AVAILABLE, THE GREAT RAILROAD SYSTEMS COULD NOT HANDLE ENOUGH TRAINS TO CARRY ON THE BUSINESS OF THE COUNTRY.

EXHIBIT No. 169

J. F. SLIDDEN
Wire-Fences.

No. 157,124

Patented Nov. 24, 1924



BARBED WIRE

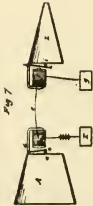
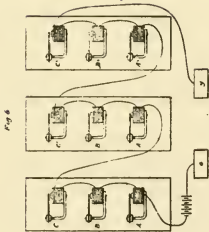
BY THIS INVENTION IT WAS MADE POSSIBLE TO CHEAPLY AND EFFICIENTLY FENCE VAST AREAS OF OUR FARMS. THUS SAVING AN IMMENSE AMOUNT OF WOOD REQUIRED FOR OTHER TYPES OF FENCES AND CONSERVING OUR FAST DIMINISHING FORESTS.

1937

PRODUCTION
187,000 TONSVALUE OF PRODUCT
\$11,100,000

EXHIBIT No. 170

A. G. BELL
TELEGRAPHY
No. 174,460
Patented March 7, 1876



Inventor
A. G. Bell
By
H. S. Gifford

1937

WAGE EARNERS
300,000

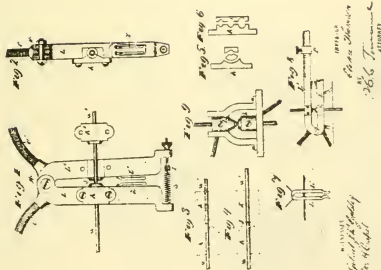
WAGES PAID
\$ 490,000,000

TOTAL INVESTMENTS
\$ 4,685,000,000

THE TELEPHONE
INSTITUTED DISTANT COMMUNICATION BY SPEECH
AND HAS BECOME THE WORLD'S INDISPENSABLE ADJUNCT.
IN OFFICES AND HOMES FOR TRANSACTING BUSINESS AND
SOCIAL AFFAIRS EXPEDITING AND INCREASING THEIR VOL
UME TO AN EXTENT BEYOND THE POWERS OF IMAGINATION

EXHIBIT No. 171

THE MODEL
E. THOMSON
APPARATUS FOR ELECTRIC WELDING
Patented Aug. 10, 1886
No. 337,140



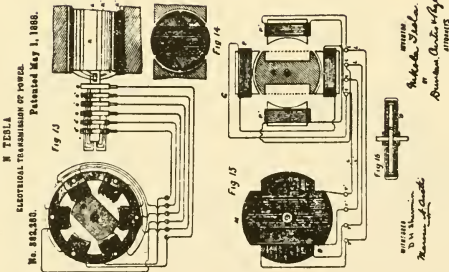
1937

WAGE EARNERS
257,700

VALUE OF PRODUCTS
\$1,622,000,000

ELECTRIC WELDING

SUPPLANTED ONE OF THE OLDEST OF METAL SECURING PROCESSES KNOWN. THIS NEW METHOD IS RAPIDLY TAKING THE PLACE OF RIVETING AND BRAZING IN HUNDREDS OF DIFFERENT DIRECTIONS, SUCH AS STRUCTURAL IRON WORK SHIPS' FRAMES AND PLATES, AND WIRE NETTING



1937

WAGE EARNERS
257,700

VALUE OF PRODUCTS
\$1,622,000,000

THE ELECTRIC MOTOR-INDUCTION TYPE

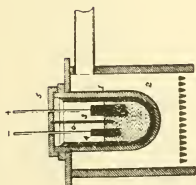
THIS INVENTION WAS THE GENESIS OF THE MODERN INDUCTION TYPE MOTOR WHICH HAS GONE BY MILLIONS INTO EXTENSIVE USE IN THE ARTS AND INTO OUR HOMES. SINCE IT UTILIZES THE EFFICIENT ALTERNATING CURRENT SO LARGELY IN USE IN INDUSTRIAL PLANTS AND HOMES THROUGHOUT THE COUNTRY

(No Model)

C. W. HALL
MANUFACTURE OF ALUMINUM

Patented Apr. 2, 1889

No 400,605.



WITNESSES:
C. W. Hall
J. E. Hatcher

IN WITNESS WHEREOF,
 Charles W. Hall
 by Edwin L. W. Hatcher

ALUMINUM PRODUCTION

WHAT WAS FORMERLY A LABORATORY PRODUCT WAS MADE THE WORLD'S THIRD MOST USEFUL METAL FOR REQUIREMENTS OF LIGHTNESS WITH STRENGTH, AND AS A BASIS FOR ALLOYS OF UNUSAL PROPERTIES. IT HAS BECOME AN INDUSTRIAL NECESSITY OF HIGHEST ORDER

1937

WAGE EARNERS 25,000

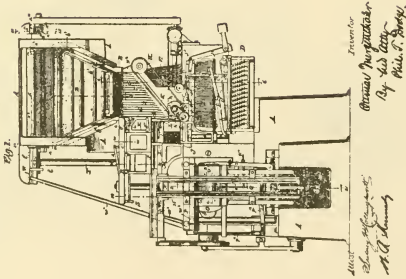
WAGES PAID \$32,000,000

VALUE OF PRODUCTS

\$180,000,000

EXHIBIT No. 174

(See Mark.)
O. MERGENTHALER.
MACHINE FOR PRODUING LITHOTYPE TYPE MATRICES, &c.
No. 436,532.
Patented Sept. 16, 1890.



1937

PRODUCTION OF
BOOKS, MAGAZINES
AND NEWSPAPERS

WAGE EARNERS
276,000

WAGES PAID
\$416,470,000

RECEIPTS AND VALUE OF PRODUCTS
\$2,200,000,000

THE LINTYPE

THE GREATEST REVOLUTION IN PRINTING SINCE THE INVENTION OF THE ART. NOT ONLY MULTIPLIES PRODUCTION FROM 5 TO 10 TIMES. BUT PROVIDES A PRINTING SURFACE THAT IS ALWAYS CLEAN AND CLEAR. THE CHEAP AND RAPID PRODUCTION OF OUR NEWSPAPERS, MAGAZINES AND BOOKS IS LARGELY DEPENDENT UPON THIS INVENTION.

EXHIBIT No. 175

No. 4441

F. E. IVES
 PHOTOGRAPHIC PRINTING PLATE.
 No. 495,341
 Patented Apr. 11, 1893

1937

FIG. 1.



FIG. 2.



Witnesses
 John R. Hoff
 O. J. S. Hoff

Inventor
 Frederick E. Ives
 by his attorney
 J. H. Hoffmann

PRODUCTION OF
 BOOKS, MAGAZINES
 AND NEWSPAPERS

WAGE EARNERS
 276,000

WAGES PAID
 \$416,470,000

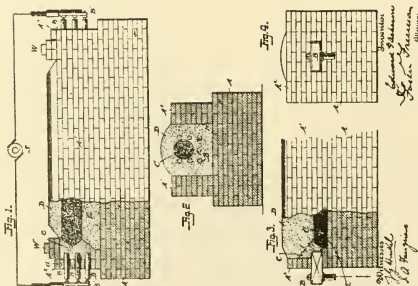
RECEIPTS AND VALUE OF PRODUCTS
 \$2,200,000,000

HALF-TONE PRINTING

THE CHEAP, RAPID AND ARTISTIC REPRODUCTION OF ILLUSTRATIONS FOR OUR NEWSPAPERS, MAGAZINES, AND BOOKS RESULTED FROM THE INTRODUCTION OF THE HALF-TONE PRINTING PROCESS, THUS MAKING THE BEST ART OF ALL THE AGES AVAILABLE TO ALL OF US FOR STUDY AND EDUCATION

EXHIBIT No. 176

F. G. ACHESON
ELECTRICAL FURNACE.
No. 560,291.
Patented May 19, 1896.



1937

WAGE EARNERS
257,700

VALUE OF PRODUCTS
\$1,622,000,000

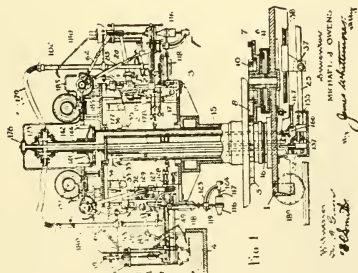
ELECTRIC FURNACES

CARBORUNDUM

THIS ARTIFICIAL MATERIAL, HARDER THAN ANY OTHER
SUBSTANCE EXCEPT ONE OR TWO PRECIOUS AND COSTLY
MINERALS, HAS HAD A NOTEWORTHY INFLUENCE AS AN ABR-
SIVE FOR ITS FAST CUTTING QUALITIES

EXHIBIT No. 177

NO. 547,754
 M. J. OWEN
 GLASS SHAPING MACHINE.
 PATENTED AUG. 2, 1904.
 REFERENCE BEING MADE TO FIG. 1.



THE GLASS BOTTLE MACHINE

THE IMMENSE PRODUCTION OF GLASS BOTTLES, JARS AND LIKE ARTICLES BY AUTOMATIC MACHINERY OWES IT INCEPTION TO THIS INVENTION. WITHOUT THIS KIND OF MACHINE IT WOULD BE IMPOSSIBLE TO FURNISH CHEAPLY AND IN THE VAST NUMBERS REQUIRED THESE VERY ESSENTIAL ARTICLES OF DOMESTIC USE.

1937

VALUE OF CONTAINERS
 \$161,000,000

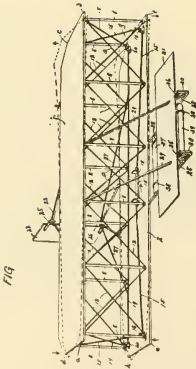
TOTAL VALUE OF PRODUCTS
 \$388,000,000

WAGE EARNERS
 79,000

WAGES PAID
 \$102,000,000

EXHIBIT No. 178

8, 161,395
O. & W. WELSH,
PATENTED MAY 24, 1906.
EXTENDED MACHINE.
APPLICATION FILED MAR 19, 1909.



INVENTORS
O. & W. WELSH
BY
H. H. HARRISON
ATTORNEY

1937
CIVIL WAGE EARNERS
45,000

VALUE OF AIRCRAFT
\$106,568,000

AEROPLANE
THIS INVENTION PUT FLYING ON A PRACTICAL BASIS
AND MADE POSSIBLE THE COMMERCIAL AEROPLANE OF
TODAY. AND ALSO MADE POSSIBLE MILITARY AVIATION

EXHIBIT No. 179

APPLICATIONS AND PATENTS
INCLUDING DESIGNS AND REISSUES
1836 TO 1937

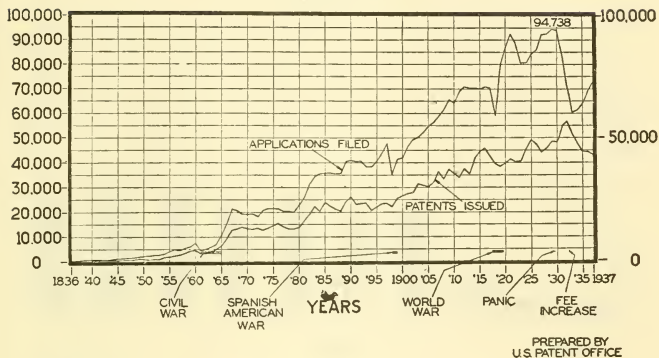


EXHIBIT No. 180

APPLICATIONS AND PATENTS
1921 TO 1938
(EXCLUDING DESIGNS & REISSUES)

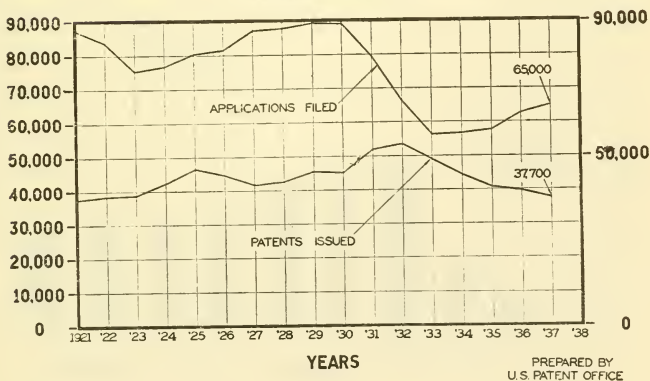


EXHIBIT No. 181

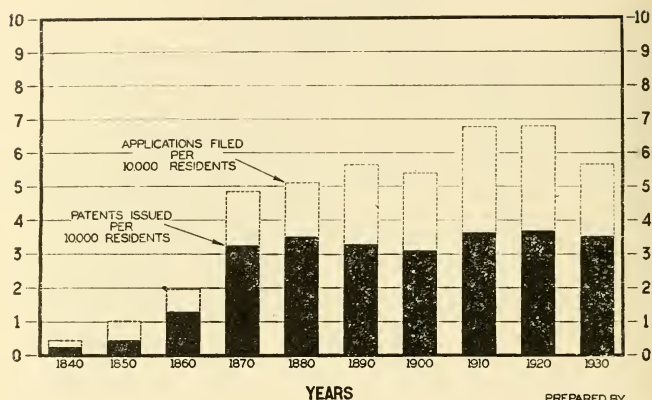
RATIO OF
PATENTS TO POPULATION

EXHIBIT No. 182

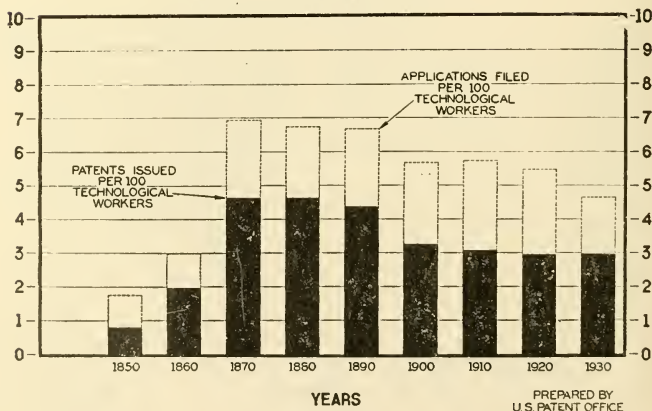
RATIO OF
PATENTS TO TECHNOLOGICAL WORKERS

EXHIBIT No. 183

PATENTS ISSUED TO LARGE CORPORATIONS

(EXCLUDING DESIGNS & REISSUES)

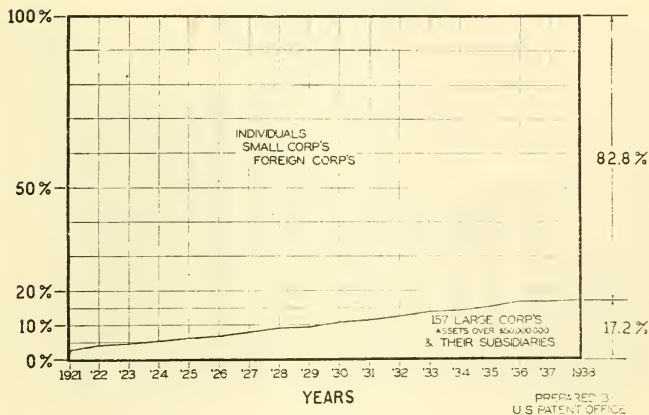


EXHIBIT No. 184

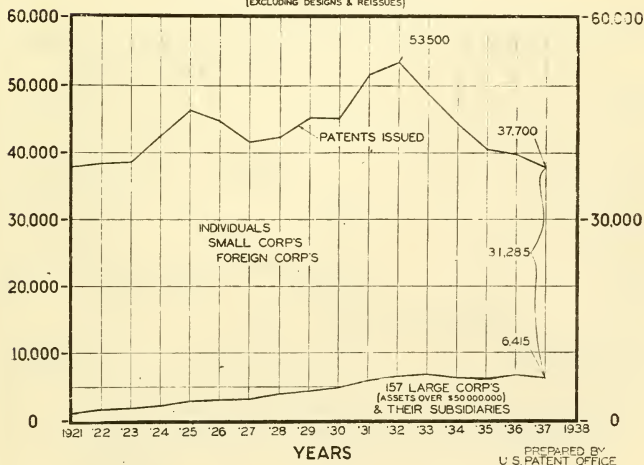
PATENTS ISSUED TO LARGE CORPORATIONS
(EXCLUDING DESIGNS & REISSUES)

EXHIBIT No. 185

PATENTS ISSUED TO LARGE CORPORATIONS
(ASSETS OVER \$ 50 000 000)
RATIO OF PATENTS TO TOTAL ASSETS

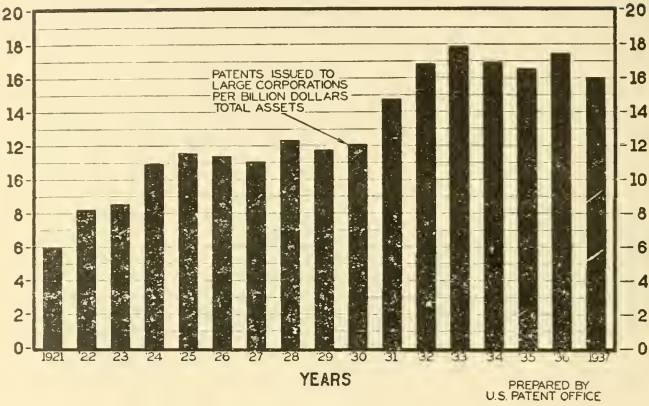


EXHIBIT No. 186

DISTRIBUTION OF PATENTS AS ISSUED
(EXCLUDING DESIGNS & REISSUES)

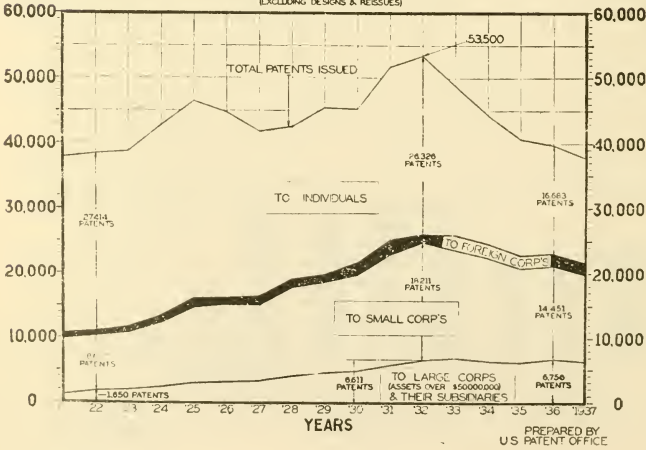


EXHIBIT No. 187

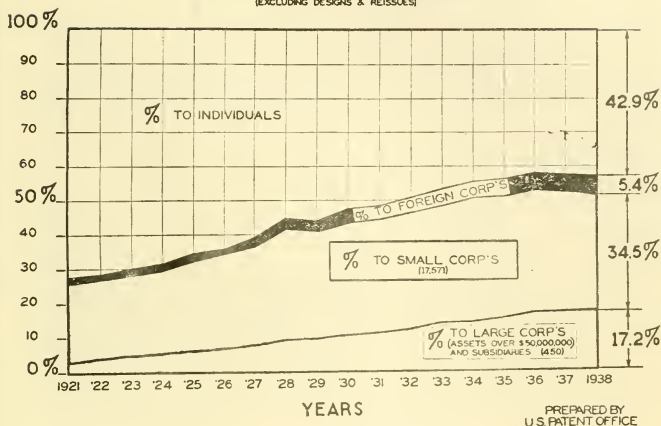
DISTRIBUTION OF PATENTS AS ISSUED
(EXCLUDING DESIGNS & REISSUES)

EXHIBIT No. 188

PATENTS ACQUIRED BY CORPORATIONS

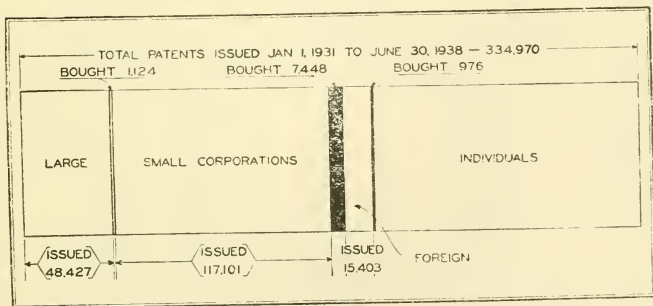
PREPARED BY
U. S. PATENT OFFICE

EXHIBIT No. 189

UNEXPIRED PATENTS OWNED BY CORPORATIONS (EST.)

Subsidiaries not combined with parent corporations

Number of Patents Owned By Each Corporation	CLASS OF CORPORATIONS							
	Large		Foreign		Small		Total	
	No. of Corps.	No. of Patents	No. of Corps.	No. of Patents	No. of Corps.	No. of Patents	No. of Corps.	No. of Patents
8001-9000	1	8,488	.....	.....	.....	.....	1	8,488
7001-8000	0	0	.....	.....	.....	.....	0	0
6001-7000	0	0	.....	.....	.....	.....	0	0
5001-6000	1	5,112	.....	.....	.....	.....	1	5,112
4001-5000	1	4,467	.....	.....	.....	.....	1	4,467
3001-4000	2	7,558	.....	.....	.....	.....	2	7,558
2001-3000	3	8,011	1	2,734	.....	.....	4	10,745
1001-2000	7	11,033	2	2,335	4	5,236	13	18,604
1-1000	435	36,043	3,233	24,182	17,567	243,915	21,235	304,140
Total	450	80,712	3,236	29,251	17,571	249,151	21,257	359,114

PREPARED BY U. S. PATENT OFFICE

EXHIBIT No. 190

UNEXPIRED PATENTS OWNED BY CORPORATIONS (EST.)

Corporations owning less than 1,000 patents each

Number of Patents Owned By Each Corporation	CLASS OF CORPORATIONS							
	Large		Foreign		Small		Total	
	No. of Corps.	No. of Patents	No. of Corps.	No. of Patents	No. of Corps.	No. of Patents	No. of Corps.	No. of Patents
901-1000	0	0	0	0	0	0	0	0
801-900	3	2,512	0	0	5	4,285	8	6,797
701-800	3	2,295	1	780	3	2,228	7	5,303
601-700	6	3,702	1	642	4	2,645	11	6,989
501-600	6	3,346	1	583	16	8,870	23	12,799
401-500	7	3,180	1	428	17	7,643	25	11,251
301-400	7	2,408	1	306	30	10,417	38	13,131
201-300	21	5,313	6	1,553	70	16,981	97	23,847
101-200	44	6,290	9	1,285	227	31,670	280	39,245
1-100	338	6,997	3,213	18,605	17,195	159,176	20,746	184,778
Total	435	36,043	3,233	24,182	17,567	243,915	21,235	304,140

PREPARED BY U. S. PATENT OFFICE

EXHIBIT No. 191

PATENTS ISSUED TO CORPORATIONS

JANUARY 1, 1931 TO JUNE 30, 1936-7½ YEARS

PATENTS ISSUED TO EACH CORPORATION IN 7½ YEARS	CLASS OF CORPORATIONS							
	LARGE		SMALL		FOREIGN		TOTAL	
	NUMBER OF CORPS.	PER CENT OF TOTAL	NUMBER OF CORPS.	PER CENT OF TOTAL	NUMBER OF CORPS.	PER CENT OF TOTAL	NUMBER OF CORPS.	PER CENT OF TOTAL
8	9	2	308	2	34	1	351	1
7	10	2	351	2	43	1	404	2
6	13	3	491	3	57	2	561	3
5	16	3	666	4	100	3	782	4
4	14	3	940	5	134	4	1,088	5
3	17	4	1,505	9	227	7	1,749	9
2	36	8	2,771	16	503	16	3,310	16
1	66	15	7,823	44	1,880	58	9,789	46
TOTAL OF CORPORATIONS AVERAGING NO MORE THAN ONE PATENT PER YEAR	181	40	14,855	85	2,978	92	16,014	85
TOTAL OF CORPORATIONS TAKING PATENTS	456	100	17,571	100	3,236	100	21,257	100

PREPARED BY U. S. PATENT OFFICE

EXHIBIT No. 192

ORGANIZATION CHART — U. S. PATENT OFFICE

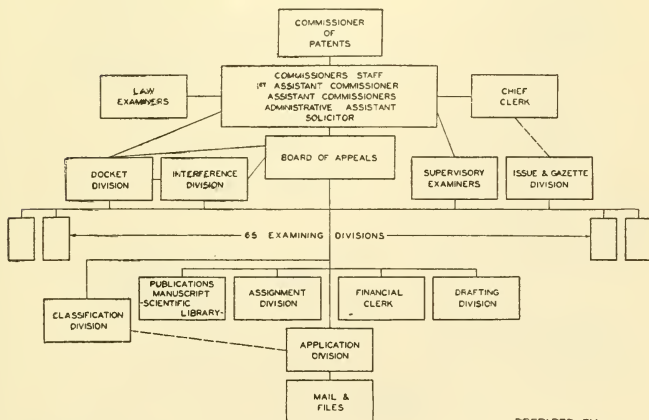
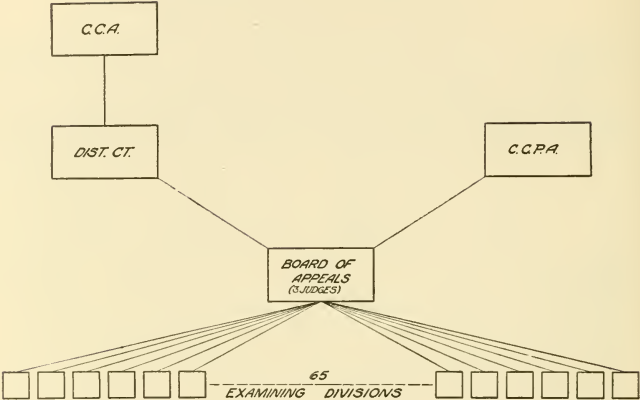
PREPARED BY
U. S. PATENT OFFICE

EXHIBIT No. 193

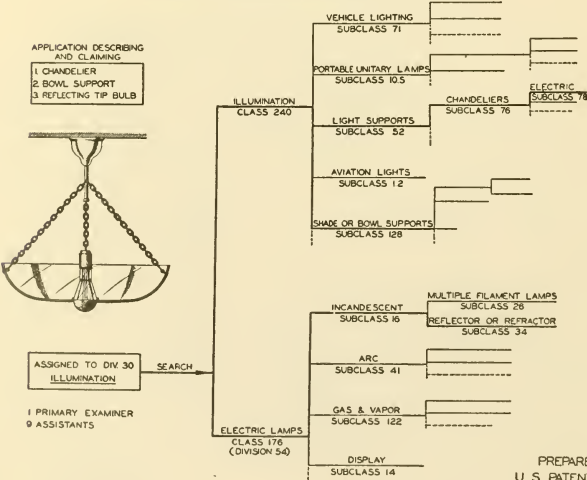
PROCEDURE IN OBTAINING PATENTS



PREPARED BY
U.S. PATENT OFFICE

EXHIBIT No. 194

EXAMINATION PROCEDURE OF PATENT APPLICATION



PREPARED BY
U S PATENT OFFICE

EXHIBIT No. 195

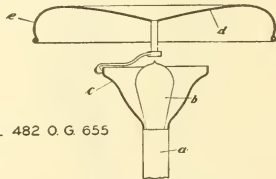
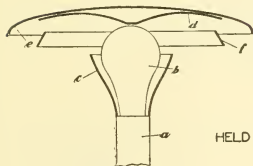
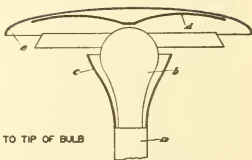
PATENT 2,058,139

ORIGINAL CLAIM

- (a) SOCKET
- (b) BULB
- (c) REFLECTOR
- (d) REFLECTOR CLOSE TO TIP OF BULB
- (e) SHADE

CLAIM ALLOWED AFTER REJECTION:

- (a), (b), (c), (d), (e), AS ABOVE AND
- (f) SPACED SCREEN

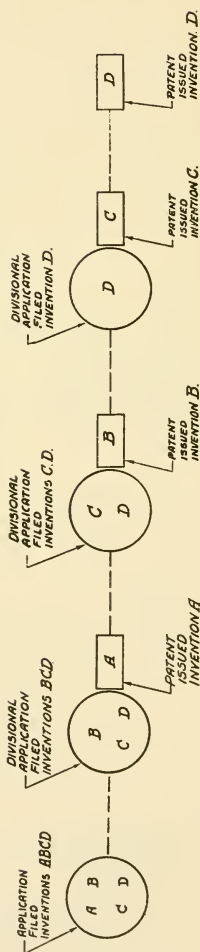
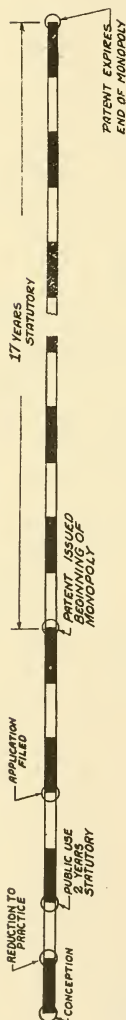


HELD VALID D. C., N. ILL. 482 O. G. 655

PREPARED BY
U S PATENT OFFICE

EXHIBIT No. 196

PATENT MONOPOLY



PREPARED BY: U.S. PATENT OFFICE.

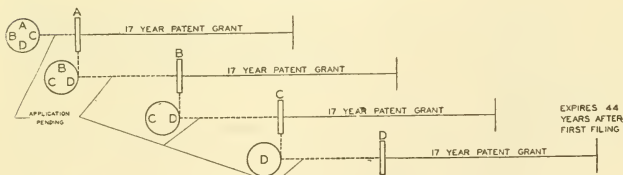
EXHIBIT No. 197

APPLICATIONS PENDING

5 OR MORE YEARS	4,015	---	2,879	2,976	2,731	2,283	1,924
3 TO 5 YEARS	---	---	13,529	11,804	8,388	6,357	5,994
UNDER 3 YEARS	---	---	97,793	91,371	92,976	101,095	108,123
TOTAL	180,355	---	114,201	106,151	104,095	109,735	116,041
	1932	1933	1934	1935	1936	1937	1938

PREPARED BY U. S. PATENT OFFICE

EXHIBIT No. 198

PATENT MONOPOLY
PERMITTED UNDER PRESENT LAW

UNDER PROPOSED 20 YEAR BILL

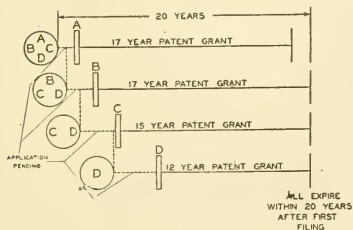
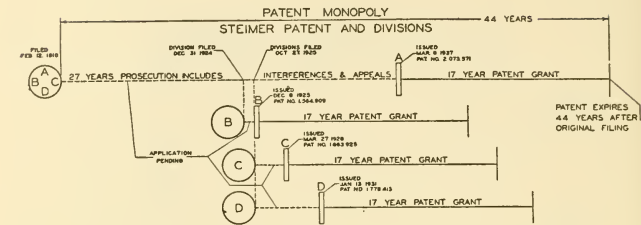
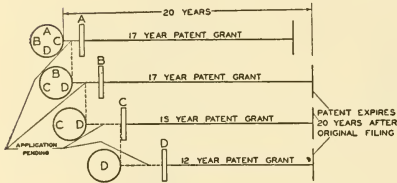
PREPARED BY
U S PATENT OFFICE

EXHIBIT No. 199



UNDER PROPOSED 20 YEAR BILL



PREPARED BY
U S PATENT OFFICE

EXHIBIT No. 200

INTERFERENCES DECIDED ON EVIDENCE
1924 - 1933
(10 YEARS)

ULTIMATE TRIBUNAL	NUMBER OF CASES	DURATION					
		MINIMUM		MAXIMUM		AVERAGE	
		YEARS	MONTHS	YEARS	MONTHS	YEARS	MONTHS
EXAMINER	1,612	-	5	6	4	1	11
BOARD OF APPEALS	784	-	9	8	5	2	11
COURT	317	1	2	10	9	4	5
ALL CASES	2,713	-	5	10	9	2	6

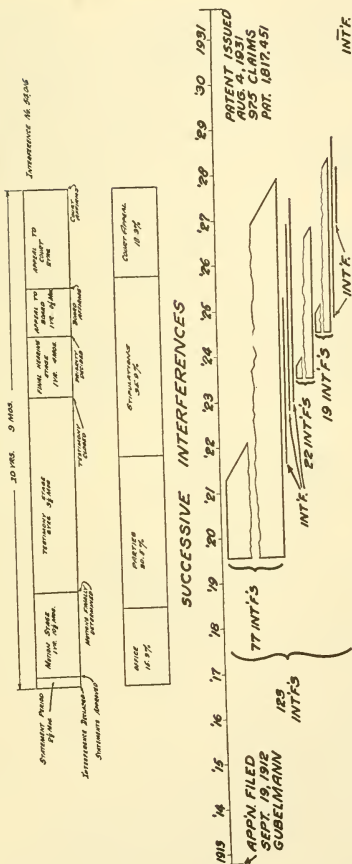
TOTAL NUMBER DECLARED DURING PERIOD-17,162

PREPARED BY U. S. PATENT OFFICE

EXHIBIT No. 201

UNUSUAL INTERFERENCES

LONG DURATION



COMPLICATED SERIES

[illegible]

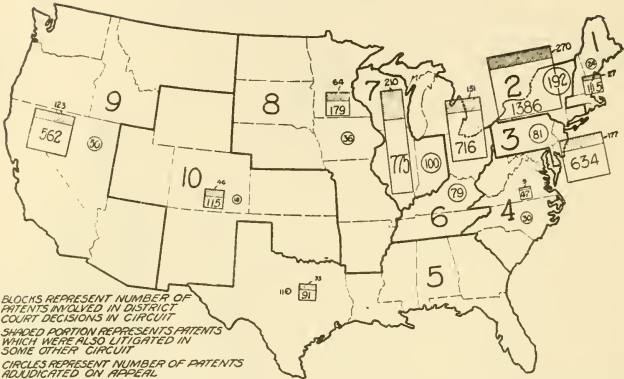
PREPARED BY
U.S. PATENT OFFICE

1 DISSOLVED	19 JUDGMENT	2 RECORD
5 CONSOLIDATED		16 CONCESSION
		1 TESTIMONY

**1 DISSOLVED
5 CONSOLIDATED**

EXHIBIT No. 202

PATENTS IN LITIGATION



(COMPILED FROM RETURNS MADE TO PATENT OFFICE BY COURT CLERKS)

PREPARED BY U.S. PATENT OFFICE

EXHIBIT No. 203

A CASE HISTORY
OF
THE LITIGATION ON ONE PATENT

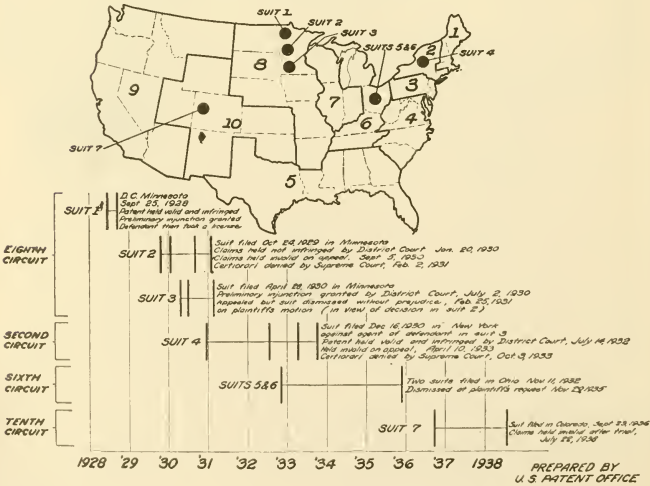
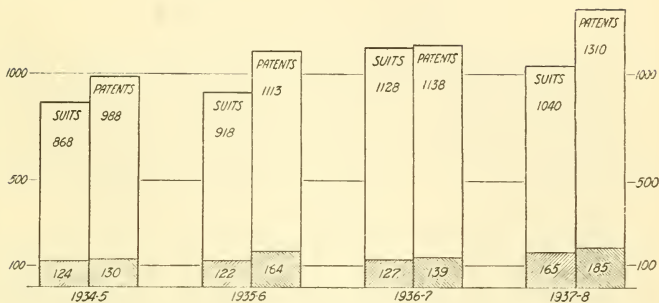


EXHIBIT No. 204

PATENT LITIGATION



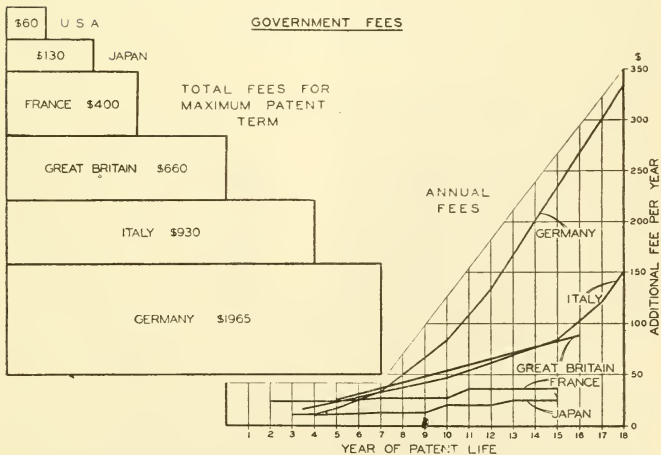
PATENT SUITS TERMINATED IN THE DISTRICT COURTS, AND PATENTS INVOLVED, FOR FISCAL YEARS.

SHADED RECTANGLES INDICATE APPEALS TERMINATED BY THE CIRCUIT COURTS OF APPEALS AND PATENTS INVOLVED.

(COMPILED FROM RETURNS TO PATENT OFFICE BY COURT CLERKS)

EXHIBIT No. 205

GOVERNMENT FEES



PREPARED BY U.S. PATENT OFFICE

EXHIBIT No. 206

SCIENCE ADVISORY BOARD

REPORT OF THE COMMITTEE ON THE RELATION OF THE PATENT SYSTEM TO THE
STIMULATION OF NEW INDUSTRIES

Washington, D. C., April 1, 1935

PERSONNEL OF THE COMMITTEE

W. H. Carrier, chairman of the board, Carrier Engineering Corporation, Newark, N. J.

D. M. Compton, industrial consultant, Chicago, Ill.

F. B. Jewett, vice president, American Telephone & Telegraph Co.; president, Bell Telephone Laboratories, New York City.

H. A. Poillon, president, Research Corporation, New York City.

V. Bush, chairman, vice president, and dean of engineering, Massachusetts Institute of Technology, Cambridge, Mass.

INTRODUCTION

This report results from the request from the Secretary of Commerce to the Science Advisory Board for a broad policy and program for the stimulation of new industries in this country. The inquiry is directed to the stimulation of new noncompetitive industries, taking noncompetitive in the sense that they should not merely replace an existing industry or product by a substitute of no greater social value; but rather should increase the potential aggregate of gainful employment, increase the comfort and safety of living, or confer other important social benefits.

This problem was broken down by a steering committee into several parts, some of which have been referred to the Business Advisory and Planning Council. The committee which presents this report was given the specific assignment of the relationship of the patent system to the stimulation of new industries.

The committee has proceeded on the problem by consulting the literature of the subject, and the reports of previous investigations, by studying the operation of the patent systems of other countries, and by securing a consensus of opinion in regard to the operation of the system in this country. The opinion of users of the system has been primarily sought. These include inventors, engineers, scientists, businessmen, and others who have had much to do with the operation of the system in a broad way. Their opinion is of greatest importance, since the functioning of the patent system is a matter of much larger scope than its mere legal aspect.

The opinion of prominent patent attorneys has also been available, and the point of view of various committees of patent attorneys is on record on most of the points considered, as a result of the hearings before the Patent Committee of the House of Representatives. The committee has thus reviewed carefully the judgment of those in a position to know concerning the extent to which the patent system operates smoothly and effectively for its intended purpose, and the ways in which it may be caused to be of greater benefit than at present. It has considered specific remedies, and on these has studied the arguments which have been presented. On the basis of this study the committee has formed its own opinions, and it is the object of this report to point out defects and recommend remedies.

The patent system of the United States was set up originally to bring benefit to the public by advancing the useful arts. It does so by creating a temporary monopoly, thereby rendering possible the hazardous development of untried inventions, which would otherwise not come to fruition to add to the general well-being and increase the standard of living of the people. By its substantial rewards it stimulates invention, and the assiduous study and persistent effort on which invention is based. That it has been successful needs no demonstration, for its results are all about us.

The primary purpose of the patent system of this country is to stimulate new industries. This is always an important matter, but it becomes particularly important as the country now emerges from a serious depression. The history of previous depressions shows that the time of emergence is usually marked by important technical advances resulting in the creation of new and extensive industries. If this had not occurred we could not have attained the present high standing of living. For the prosperity of the country it is imperative that this trend should continue.

The patent system in the past has been one of the primary influences in shaping American industrial life, and it has assisted enormously in the development of the country. In the considered opinion of those best able to judge, it is not however at the present time functioning to full advantage. There are serious difficulties. The use of scientific results in industry is a much more complicated matter than when the patent system was first set up, and the system has not been altered to bring it closely in line with the modern complex matters with which it has to deal. If it is to fulfill its proper function to the greatest possible extent it is therefore essential that it be changed in certain ways in order that new industries may be stimulated and not inhibited by its operation.

The patent system of this country is old, and it has gradually developed into a complex structure. Radical changes in such a system should of course not be undertaken without serious and careful consideration. It would be equally fatal however to refuse to consider alterations at all when the changed times dictate modification. It is in this spirit that the committee has approached this work, in the attempt to combine a just conservatism with a willingness to actually face facts and conditions. The report is directed primarily at the essential problems, leaving untouched many minor details and methods of procedure.

In a complicated situation, such as this, it is not possible to point out panaceas which will automatically treat every individual case that can be cited for the optimum public benefit and with complete equity. Objections can be raised, and will be raised, to every suggested change in a system which so closely affects the interests of widely different classes of individuals. The attempt has been made to recommend as few changes as possible, and to make these changes in such manner as to bring the greatest good to the greatest number.

There are three primary defects in the system as it stands at present, considered in connection with the functions which it is called upon to perform in a modern complex technical world. The first defect arises by reason of the issuance by the Patent Office of an enormous number of patents, many of which should never be issued, due primarily to an unduly low standard of invention. The second defect has to do with the excessive cost and delay in the litigation of patents, by reason of the present system of appeals. The third results from the difficulty met by the courts in handling scientific or technical questions without competent non-partisan assistance.

As these defects exist there is a question in the minds of many serious minded and experienced men whether the system is not after all more of a liability than an asset. It is seriously suggested that the system has become so complex and cumbersome that it may break down of its own weight. Your committee feels that the situation, while serious, is not at all hopeless; and that it is possible to make certain changes in procedure, not in themselves difficult to put into effect nor expensive, and not changing the existing structure in any essential or radical manner; but which may restore the system to its former condition of importance and beneficent influence on American industry. This results in our three major recommendations. The advisability of a system of compulsory licensing has also been seriously raised. The committee has studied this problem, and recommends that no steps be taken in this direction at the present time.

Finally, the opinion of the committee is expressed on several minor changes in procedure or desirable undertakings.

I. INCREASE OF THE PRESUMPTION OF VALIDITY OF ISSUED PATENTS

The Patent Office now issues many patents which are later found invalid in the courts. It issues a much larger number which never can have commercial importance. With two million United States patents issued, the situation is unduly complex and is growing worse. When approximately 90,000 patents are applied for in a year the amount of attention which can be paid to each one in the Office is not sufficient to insure a strong presumption of validity in issued patents. The staff is overburdened. It has neither the opportunity nor the facilities to make the study and search necessary to clarify the situation, and the trivial, and the obvious are issued to confuse American business. This situation is not the fault of the Patent Office personnel. It results from the nature of the technical advance which has taken place in the past few decades. It should however be positively corrected.

The standard of invention cannot be arbitrarily raised by creating a new definition of invention. The courts can influence the standard through their decisions only gradually, and by the undesirable means of finding invalid a large fraction of the patents which come before them, which, temporarily at least, decreases rather than increases the presumption of validity of patents as issued.

The Commissioner of Patents should be supported in his efforts to eliminate the trivial and the obvious; but merely increasing the number of patent office personnel will not effect a cure. There is needed a change in procedure which will aid the office in raising standards, and positively increase the presumption of validity.

Publication before issuance.—The British and German systems provide for publication of an application before issuance, thus inviting contests within the Office prior to the issuance of a patent. There are obvious objections to this procedure. The most serious objection is that the inventor is often unduly burdened with the expense of a contest, which is particularly serious for the individual inventor without resources. It is much better procedure to maintain the action in the Patent Office *ex parte*, as is our present practice. However, without incurring the difficulty of the system involving contests, it is possible to secure much of the improvement in the presumption of validity of an issued patent which such a system produces. This benefit is very real. At the present time our office issues patents without a thorough search of American and foreign literature, but with a search often devoted to American patents only, with some small attention to publications and foreign patents. The result is that many patents are issued which are clearly invalid in view of prior patents and publications. Such patents often cause expensive litigation before they are finally found invalid. The theory that the Office should issue patents with little or no examination, leaving the determination of their validity to the courts, is either practically inoperative or unduly expensive. This is substantially the French system. The American system is preferable, and it goes a certain distance toward the examination of prior art in order that a patent when issued may carry strong presumption of validity, instead of being merely a means for entering litigation. However, our procedure does not go far enough, and the provision of an adequate corps of examiners, with sufficient time and training to be able to review adequately the entire prior art, whether in patents or in the literature, would be highly expensive. A modification of the system of publication before issuance will secure the desired result without great cost. It will aid the Patent Office in increasing the presumption of validity of issued patents.

We recommend, therefore, that, when an application is ready for allowance, it be published in the Official Gazette, and the submission of pertinent facts by interested parties invited.

The publication should be made in the manner employed at present in publishing an abstract and sample claims when a patent is issued; and the allowed claims, and preferably also the specification and drawings should be opened to inspection. The publication and material opened to inspection should not disclose the date of filing, nor give any other information unnecessary for the purpose in hand. Upon such publication the Office should allow anyone interested, and within a stated time, to submit facts which are pertinent to any application thus published. These facts, however, should be limited to references or photostat copies of prior patents or other published printed papers, books, or documents, such as are available in libraries or other public sources.

Arguments and affidavits should be rigidly excluded. The procedure in the Patent Office should be maintained strictly *ex parte*. However before the patent is finally passed to issue, the Examiner should give it a further review in view of any new material thus brought to light, and either pass it to issue, or make necessary rejection of claims. Of course in case of rejection on this basis the applicant should have an opportunity to present arguments as he has at present, and an opportunity of appeal. The documents filed should be made part of the file-wrapper of the application.

An applicant who files an interfering application after such publication should be under the same heavy burden of proof as the applicant who now files an interfering patent application after the granting of a patent.

The committee believes that this change will not cause undue expense to the inventor, but will aid him by giving him a stronger patent, much less likely to be voided by the courts. The burden of submitting evidence will be welcomed by those interested in special fields of development; as it will largely avoid the more serious burden incident to the issuance of unwarranted patents.

It appears that this change can be effected by amending the Patent Office Rules of Practice. A relatively small increase in expense of operation of the Patent Office is involved, and this should be provided for in the proper Congressional legislation.

2. HARMONY AND ACCURACY IN JUDICIAL INTERPRETATIONS OF PATENT QUESTIONS

A great deal of delay and confusion results from our present system of litigation of patents. The patent suits on a single important patent may cost several hundred thousand dollars. Such a burden confronting a young and struggling new industry often results in its thorough discouragement. It is possible under the present system for very many years to elapse between the initiation of proceedings and their final disposition, and industry in the meantime falters. It is possible for suits to be brought simultaneously on the same patent in several district courts. Moreover, on their appeal to the circuit courts of appeals it is sometimes the case that conflicting decisions are given in different circuits. The result of this entire situation is a serious burden on growing industry, and on this point there is the strongest feeling among users of the system of a need for simplification.

A Single Court for Patent Appeals.—We recommend, therefore, that there be established a single Court for Patent Appeals, in order to establish and maintain harmony and accuracy in judicial interpretations of patent questions, by confining the appellate jurisdiction in civil patent causes to one court, composed of permanent judges having the necessary scientific or technical background.

Each judge should be learned in the law and proficient in knowledge of the industrial application of science, and should have had a reasonable experience in the trial of patent suits on the bench or at the bar. If, in order to grasp more fully special technical questions, the court wishes to call temporarily upon experts to advise and consult on difficult points, it should be enabled to do so.

In view of the importance of this court the salaries paid to the judges should be adequate to attract men of the highest stamp. The qualifications have two aspects, and it is accordingly desirable that scientific as well as legal opinions and suggestions concerning appointees be given weight.

In the phrase "civil patent causes" we include suits in Federal Courts, other than the Court of Claims, (1) alleging infringement of a patent, (2) alleging breach of a license agreement involving a patent or invention, (3) in equity to obtain a patent, (4) in equity alleging interfering patents, or (5) under the declaratory-judgment law, involving any of the above issues.

The Court should be composed of a sufficient number of permanent judges, any three of whom should constitute a quorum. The Court should be located in Washington, D. C.; and should also hold terms at least once a year in each judicial circuit, except as these may be omitted at the discretion of the senior or chief justice of the Court.

It appears desirable that there should be transferred to this new Court the present jurisdiction of the Court of Customs and Patent Appeals of all patent and trade-mark appeals from the Patent Office. On these matters of scope of jurisdiction and regulations concerning place of sitting your committee entertains no strong convictions. Rather it wishes to place emphasis on the desirability of a single court, adequately provided for, composed of judges of high qualifications, with final jurisdiction in patent causes except as their findings may be reviewed by the Supreme Court on writ of certiorari. Such a court will bring to industry that certainty and expedition which is essential if the patent system is to be fully effective in stimulating new industries.

In order to put this recommendation into effect congressional legislation is needed.

3. ADEQUATE SCIENTIFIC OR TECHNICAL ASSISTANCE TO COURTS OF FIRST INSTANCE IN PATENT CAUSES

The determination of the just equity in a patent suit involves two diverse aspects, the law and the technical facts. When the technique involved was simple, before science had made the great strides of the past generation and before the fruits of its progress became applied and embodied in patents, the judge could readily acquire during the progress of a suit that background necessary for him to understand the technical facts presented to him. To expect him to do so today, with the present specialization and intensification of technical knowledge, leads to a severe burden upon him, and to undue expense to the litigants. It is true that the litigants call their own experts; but this does not fill the need. The Court itself should be so composed as to understand and deal adequately and promptly with the matters brought before it. This has been embodied in the previous recommendation of a single court for patent appeals. It is especially desirable that courts of first instance be also so constituted as to treat difficult technical questions with precision and promptitude.

Advisors to the Court and Technical Jurors.—We therefore recommend that there be provided scientific or technical advisors or juries to furnish adequate scientific or technical assistance to courts of first instance in equity patent causes.

The phrase "equity patent causes" is used to exclude suits at law, but is otherwise synonymous with "civil patent causes" as used in the preceding section.

The advisors or jurors should be United States citizens of sufficient scientific or technical qualifications so that they are expert in the art to which the suit relates. They should be selected by the Court, with such suggestions from the litigants as may be solicited; but without the necessity of securing agreement of the litigants to the selection.

Initially they should be selected at large. It is recommended however, that steps be taken to prepare and maintain an adequate list of qualified experts, and that upon its establishment selection should be confined to this list. It is believed that the National Research Council, in cooperation with the national scientific and engineering societies, would be the proper agency to be charged with the duty of preparing and maintaining a list for this purpose.

It has been stated that it would be difficult to find properly qualified experts. Your committee is convinced that no such difficulty will exist. It is true that there are many fully qualified scientists and engineers who consistently decline to act as experts for litigants in patent cases; often because the partisan presentation of a cause, while necessary and proper, is natural for an attorney but unnatural for a scientist or engineer. To a call from the courts for dignified and non-partisan aid in the handling of patent cases there will be ample response. Nor does this country lack men of the highest type, both from the standpoint of their professional attainments in the sciences and their applications, and from the standpoint of their trustworthiness and public spirit.

It should be mandatory upon the Federal district courts in equity patent causes to utilize the services of either a technical advisor or a technical jury, but the court should be free to select either alternative, and should make selection anew for each suit.

When a technical jury is utilized its report should be final as to questions of fact. Three jurors should be sufficient.

When an advisor is utilized he should be merely advisory to the court, and his report, if called for by the Court, should have the same presumption of accuracy as a master's report has, under the Equity Rules.

The advisor or jury should act in conjunction with the court and under its direction as to procedure.

The compensation of experts employed in this manner should be commensurate with their usual earning power. It should preferably be fixed by the court, as is done now with masters under the Equity Rules, but it may be fixed by statute, in which event the maximum per diem should be such as is customary for consultants with high standing in their professions. This compensation may be taxable as part of the costs of the suit, as is done now with masters under the Equity Rules; or it may be paid by the government as a part of the cost of maintaining the courts. On the matter of the allocation of the expense your committee expresses no convictions.

This modification in procedure will notably and properly increase the prestige and dignity of the courts. It will utilize, in the speedy and just disposition of patent causes, the great asset which this country has in its body of scientific and technical men. It will, by causing expedition, decrease the costs of litigation; and by rendering our patent system more sure and effective, it will benefit especially inventors and new industries, and thus benefit the people generally.

It appears that this change can be largely effected by the United States Supreme Court through an amendment to the Equity Rules, although congressional legislation may be needed on some points.

4. THE QUESTION OF COMPULSORY LICENSING

There have been repeated suggestions that some system of compulsory licensing be introduced in this country. The usual reason given for the need of such a system is that patented articles are sometimes not manufactured and made available to the public, for one reason because of the failure to reach an agreement on the part of those owning several patents, all of which are involved. The principal argument against compulsory licensing is the statement that by decreasing the strength of the patent monopoly it would reduce the incentive to invention and development, and vitiate to a considerable extent the effectiveness of the system in the development of industry. The point is a difficult one, and it goes directly to the heart of the system.

We recommend that no system of compulsory licensing be introduced at this time.

Your committee has given serious consideration to the problem, and concludes that it has not as yet been constructively analyzed with the completeness which should precede any such fundamental alteration in our patent system as is here involved. Such a study should be made, by a group combining legal, scientific, and business points of view; which can approach the problem judicially and without prejudice, and with ample time for its full consideration. The nature of the problem is brought out by the following:

There has been enormous change in technique and commercial practice in the last hundred years. The patent system at its inception contemplated an individual inventor, given a monopoly for 17 years as a reward and stimulant for invention, and to enable funds to be obtained for commercialization. This simple situation no longer obtains. What was originally a self-sufficient patent to an individual for 17 years has developed into a patent structure or assemblage of patents, giving a substantially permanent monopoly in an advancing art to an industry or a group of industries. The justification for the extension in a democratic country of an absolute monopoly to an inventor for 17 years, on the basis that this is a reasonable reward for his disclosure of his invention in lieu of maintaining it secret, no longer applies generally. In these days of intensified research and development it is the usual experience to find that important advances arise nearly simultaneously at many points. They are the result of an advancing knowledge and technique, and the advent of a specific human need and commercial opportunity. The individual inventor plays an important part in recognizing the situation and supplying the needed combination. In most cases however he could not hold it secret and use it privately if he wished. Moreover if he did not appear with his invention it would not be long in these intense times before some other inventor would supply the necessary creative thought. This is not exclusively the situation of course. There are still brilliant and striking flashes of intellect which create startling inventions which would not otherwise be made for perhaps a generation. The point is that inventions of this type are few and far between, and they are insignificant in number compared to the nearly 100,000 patents now issued annually. Moreover most of these brilliant advances would be made and disclosed whether or not there were a patent system designed to produce a reward. The old justification for the extension of exclusive monopoly no longer holds.

There is still however a fully valid reason for continuing the system of extending a patent monopoly. New developments are hazardous. Only a small fraction of the attempts to bring into public use new and untried combinations are commercially successful. It is imperative that there should be an opportunity for the successful venture to reap a speculative profit. If it were assured only of a competitive profit, funds would not flow into new ventures, and this country would soon lose its place in a rapidly advancing technique. The opportunity for the necessary speculative profit can be secured only by the extension of a monopoly. Moreover there is great danger that an ill-advised restriction of this monopoly would cut the heart out of a system on which a great part of the striking industrial development of this country has been based.

Certainly a system of compulsory licensing based merely on failure to manufacture under a patent, such as has been in effect with dubious results in several countries, is not an adequate solution of the problem. A group which succeeds in arriving simultaneously at two new ways of adequately supplying a public need should not be penalized by being forced to manufacture both resulting devices.

Much of the difficulty arises because, under the law, all inventions are treated on an equal basis. A new collar button and a new flying machine result in patents granting similar rights and privileges. Careful consideration should be given to the desirability of creating two classes of patents, major and minor, with a relatively limited grant under the latter. A part of the distinction should result from the fact that some inventions are of such nature that they demand large and perilous expenditures, such as become expedient under monopoly, in order to bring them to fruition for the public benefit; whereas other inventions would come into use whether there were a patent system or not.

Under the present system, when a suit for infringement is successful, the court has no alternative than to assess profits and damages and order the cessation of infringement. When a patent has thus been found valid and infringed the court cannot consider the public interest when called upon to issue an injunction to stop the use of the combination by others than the owner and his licensees.

Often the infringed patent is incidental or minor, or its primary utility may lie in an entirely different field. It would appear reasonable that in such cases, and

to prevent unwarranted disruption of industry, the Court should be enabled to order the payment of reasonable royalties, rather than simply to order cessation. Such a provision would resolve the quandary in which Courts are forced by the strict letter of the law to act in a manner contrary to what appears to be broad public interest. Yet the determination that such a situation really existed would be difficult, and the evaluation of the extent to which a given patent controlled a given situation would be bound to be vague. In order to be definite such a change in our basic patent law as is here envisaged should therefore wait until the classification of patents into major and minor groups has been established; or until some equally positive way has been developed of delimiting the discretionary power of the courts.

The situation is thus a complicated one, in which hastily considered changes are highly inadvisable. It is believed that the modifications recommended in this report will result in a firmer base from which to approach the whole question of compulsory licensing.

5. SECONDARY MODIFICATIONS AND MINOR RECOMMENDATIONS

Your committee reiterates that it believes the three major modifications recommended above are of primary importance. However, there are many secondary modifications, some of which are already receiving effective attention on the part of the Advisory Committee to the Patent Office, on which comment is in order.

A. Patent Office Personnel and Facilities

Every effort should be made to increase the standing and ability of the personnel of the Patent Office. They are handling an exceedingly difficult piece of work, which is an essential undertaking for the good of the country. In this work they should be generously supported. There are various ways in which they can be assisted, outside of the simple matter of remuneration. It appears desirable that examiners should have an opportunity to become acquainted with the developments in their field, by visits to industry and by further study, in order that they may perfect themselves in the handling of their advancing arts. They should have better library facilities. It appears also desirable that there should be a mechanism by which they may consult experts on scientific or technical questions, of course without disclosure of any matter under their consideration. They represent the public in important negotiations and the dignity of their position should be enhanced, and real accomplishment in this important public service recognized. The appropriations to the Patent Office for the purposes above should be liberal. It should receive direct subsidy in addition to all income from fees. The benefit to industry will return this investment tenfold.

The committee wishes to record that, in its extensive contact with inventors, scientists, and industrialists during this study, it has been impressed with the fact that the Patent Office personnel, and the Commissioner of Patents, have almost uniformly been commended.

B. Delays

The matter of delays is always serious. The burden which this places on industry at large is not always comprehended. Technical matters move much more rapidly in these days than they did a generation ago, and there is no inherent reason why legal matters should not also become accelerated. We are in a vastly different age from that when it took months to communicate with Washington. It would appear that the time allowed for the answer to an Office action and the time allowed before the payment of a final fee might with propriety be still further reduced. Similarly the allowable delays in interferences should be cut down. Since, in American practice, the monopoly runs from the date of issue rather than the date of application, and since attorneys often delay the prosecution of applications in order thus to extend the effective monopoly, the Patent Commissioner should in the public interest rigorously restrict the pendency of applications and the duration of interferences to the minimum period consistent with proper examination and adjudication, and the Office rules should be modified wherever necessary to bring this about. These matters are receiving attention by the Advisory Committee to the Patent Office, together with others affecting the procedure in that Office. Progress has been made, particularly in regard to interferences, and further progress is desirable.

Another type of delay occurs in connection with litigation. Your committee feels that wherever these are unnecessary they should be studiously avoided, as they constitute a serious drag on industrial progress. There is a delay which

sometimes occurs by reason of the failure of a judge to give his decision promptly after the conclusion of a suit. It is realized that an interval at this time is necessary in order that a judge may read the law. However it appears that the interval which occurs between the conclusion of the suit and the rendering of the decision is often much longer than is necessary for this purpose. This appears to be often due to the difficulty experienced by the judge in fully understanding the technical facts presented to him, and in such cases the modification in court procedure recommended in this report will remove much of this difficulty. If delay occurs by reason of undue burden on the judge, then the burden on the court should be relieved in order that it may be reduced. It is entirely possible that some judges do not realize the serious harm which may be occasioned by delay, and that a better realization of this fact would automatically result in greater expedition. The committee wishes merely to record the conviction that it is essential that delays be reduced at all points as far as is consistent with proper deliberative procedure, for the correction of the existing situation lies within the purview of the courts.

C. Joint Inventions

There is confusion regarding the matter of joint inventions. This is sometimes the reason why a patent becomes invalid on what is substantially a technicality. If the law stated that the actual inventor must sign the application, but that he may be joined if he wishes by others who have in his opinion contributed, without danger of his patent being found invalid because of the fact that their contribution is later found not to have been essential, the situation will be thoroughly clarified. This has been suggested many times.

D. Reissues, Disclaimers, Renewals

There seems to be strong argument for abolishing the granting of reissues and for simplifying the law concerning disclaimers. Expedition and clarity would also result if the practice of allowing renewals were discontinued. These matters appear to be in the nature of unnecessary complications, which confer a proper benefit in relatively rare instances, but the continuance of which in their present forms causes more confusion and cost to the public than is warranted by the results.

E. Equitable Treatment of American and Foreign Inventors

The American Inventor is at a disadvantage in certain respects as compared to the foreign inventor. This whole situation is involved with the international agreements regarding patents. It requires careful study in order that any modifications introduced shall not give justifiable offense. However, the rights of the American inventor should be maintained on the same plane as those in foreign countries who apply for United States patents, or for patents in other countries.

F. Reclassification of Patents

There has long been need for a thorough reclassification of patents in the Patent Office. The funds necessary for this piece of necessary work are not large, and should be provided.

G. Annual Taxes

There is much confusion due to the enormous number of issued patents in this country. As far as concerns those which are issued, not expired, considered valuable by their owners and yet probably invalid, little can be done except to leave the matter to litigation. There are, however, many issued patents which are now known to be worthless by those who hold them. It would be of great help if these could be removed from consideration. There are in various countries systems whereby patents are subjected to an annual tax. The result of this is promptly to remove from consideration all patents which are regarded by their owners to be not worth payment of a tax upon. Such a system would greatly clarify the atmosphere in which industry operates by removing dead material, as patents upon which the tax remained unpaid would lapse.

The introduction of such a system should, however, be made in such a way as not to increase the burden on the individual inventor. In fact he is already overburdened financially by the present filing and final fees, taken together with his attorney's fees. The part played by individual and isolated inventors in our industrial development is not proportionately as great as it once was, for the greater part of modern invention comes from the joint work of many in labora-

tories. However, the day of the individual inventor is not past, and his services to the country are needed and should be encouraged. He often points out the new and useful combination which would otherwise be overlooked if it were not for his discerning eye. The careers of successful individual inventors show that an expense at the time of making an invention is often a serious burden indeed, especially on the first invention of a series. Expense at a later stage, however, is not likely to be serious at all; for if the invention is truly important it soon attracts funds for its development, and further patent expenses in the patent office are a minor matter compared to the expense of such development, which is usually carried by others. It is desirable therefore that the initial burden on the inventor be reduced by cutting the filing and final fees, and that this be offset by imposing annual taxes.

There should then be a system of annual taxes, beginning several years after issuance, and on an ascending scale. These should be so adjusted that the total income from fees and taxes will be approximately the same as at present. By this means the burden will be no greater than at present, it will be placed where it can most readily be borne, and there will result the removal from consideration of a vast number of patents which are now simply an impediment.

6. RELATION OF THIS REPORT TO THE BROAD PROBLEM OF STIMULATING NEW INDUSTRIES

The United States has developed marvelously in a technical way. Much of this advance has been due to the innate ingenuity of its people, and the patent system has been one of the main rocks on which the prosperity of the country has been erected. The character of the people has not changed, but the times have changed decidedly. Other countries, not previously technically minded, are going forward rapidly in this direction. Competition in technical affairs will be keen, and any nation which does not rapidly progress will drop into a secondary position in a technical world. The patent system, built exceedingly wisely in the early days of our history, and developed carefully and skillfully in the hands of the patent office, the attorneys and the courts, is no longer completely in tune with modern conditions. It should be maintained and strengthened. Alteration is now essential if it is to continue to be a firm foundation for industrial advance. Modifications should be entered upon carefully and thoughtfully, without destroying any vital part of the structure, but nevertheless courageously and thoroughly. Such a procedure is essential for the welfare of the country.

This report treats merely a part of the greater problem of the stimulation of new industries. It is related to the more comprehensive program, and the benefits to be derived from a modernization of the patent system are dependent upon the treatment accorded by the people of this country to their industries generally. Yet it deals with an aspect of industry which is strong in the aptitudes of the people; the pioneering aspect on which our greatness is founded.

The frontiers have disappeared. No longer may a citizen break new ground beyond the horizon. But the opportunity for pioneering in the application of science to human needs remains, and calls for the same virtues of courage, independence, and perseverance. It still is possible to enter uncharted regions in industry, and it is still hazardous to thus open new territory for the national welfare.

There has been a powerful trend toward stronger government control of large industry in recent years. Unfortunately this has resulted in many measures which have borne heavily, and which have added artificial hazards to those naturally in the path of new ventures. Independence has been curtailed. Legal complexities have been multiplied. The making of a large profit has been frowned upon. The creation of truly new industries and products has been rendered nearly impossible. Before we emerge from our present difficulties this trend must reverse.

The removal of unnecessary hurdles in the patent system will help. It can provide, however, only part of the essential correction. He who brings a new product or a new industry into being, with consequent gainful employment and a quickening of the national tempo, must be truly encouraged. As he takes great risks, and as many failures in new ventures are inevitable for each success, so must he feel secure in the earning of that speculative profit which is his incentive. It is the function of government to protect him from badgering by any organized group, so long as he regards the primary rights of others in his attempt to advance. Above all it is the function of government to see that he is constrained in his activities within the path of legitimate effort in as simple a manner as possible.

The patent system requires modification in this regard. But the welfare of the pioneer should be always prominently in mind wherever government control of industry is considered, in regulations concerning fair competition, in systems of taxation, in rules regarding the issuance of securities, and in all other control which affects him. Upon his progress depends the standing of our country in a shrunken world of intense competition, and the standard of living of our people compared to those of other lands. We sadly need to return to the realization that the pioneer is a benefactor, against whom the door of opportunity must not be closed.

EXHIBIT No. 207

[Source: Submitted by Ralph E. Flanders, President, Jones & Lamson Co.]

THE UNITED STATES OF AMERICA

To all to whom these Letters Patent shall come:

Whereas Asahel Hubbard, a citizen of the United States, hath alleged that he has invented a new and useful improvement in the revolving hydraulic engine, which improvement he states has not been known or used before his application hath made oath that he does verily believe that he is the true inventor or discoverer of the said improvement, hath paid into the treasury of the United States the sum of thirty dollars, delivered a receipt for the same, and presented a petition to the Secretary of State signifying a desire of obtaining an exclusive property in the said improvement, and praying that a patent may be granted for that purpose: These are therefore to grant, according to law, to the said Asahel Hubbard, his heirs, administrators or assigns, for the term of fourteen years from the twenty-second day of April one thousand eight hundred and twenty-eight, the full and exclusive right and liberty of making, constructing, using, and vending to others to be used, the said improvement, a description whereof is given in the words of the said Asahel Hubbard himself, in the schedule hereto annexed, and is made a part of these presents.

In testimony whereof, I have caused these letters to be made Patent and the Seal of the United States to be hereunto affixed.

Given under my hand at the City of Washington, this twenty-second day of April, in the year of our Lord one thousand eight hundred and twenty eight and of the independence of the United States of America the fifty-second.

J. Q. ADAMS.

By the President:

H. CLAY, *Secretary of State.*

CITY OF WASHINGTON, to wit:

I do hereby certify That the foregoing Letters Patent were delivered to me on the twenty-second day of April in the year of our Lord one thousand eight hundred and twenty-eight to be examined, that I have examined the same, and find them conformable to law and I do hereby return the same to the Secretary of State, within fifteen days from the date aforesaid, to wit: on this twenty-second day of April in the year aforesaid.

WM. WIRT,
Attorney General of the United States.

GENEALOGY OF THE ROBBINS & LAWRENCE SHOP

[Source: Submitted by Ralph E. Flanders, President, Jones & Lamson Co.]

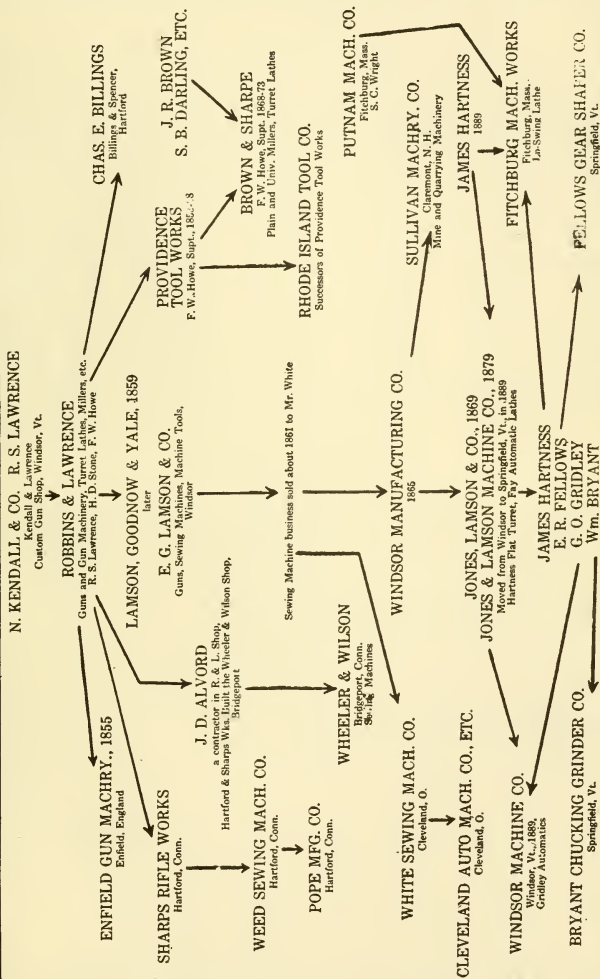


Exhibit No. 209 faces this page.

EXHIBIT No. 210

[Source: Prepared by Staff of U. S. Patent Office]

Number of patents granted by the United States to residents of foreign countries, 1930-37

	1930	1931	1932	1933	1934	1935	1936	1937	Average
Patents Granted.....	47,955	54,708	56,463	51,230	47,382	44,549	44,398	42,887	48,697
To Foreigners.....	6,085	6,897	7,374	7,170	6,459	5,980	5,734	5,638	6,421
Foreigners, %.....	12.7	12.6	13.1	14.0	13.7	13.4	12.9	13.1	13.2
To residents of Germany.....	2,066	2,479	2,751	2,854	2,482	2,196	2,068	2,106	2,375
%.....	4.3	4.5	4.9	5.6	5.2	4.9	4.6	4.9	4.8
England.....	1,162	1,255	1,463	1,350	1,275	1,237	1,262	1,178	1,273
%.....	2.4	2.3	2.6	2.6	2.7	2.8	2.8	2.7	2.6
France.....	617	756	741	690	632	550	507	559	632
%.....	1.3	1.4	1.3	1.3	1.3	1.2	1.1	1.3	1.3
Canada.....	660	541	527	451	485	444	420	418	493
%.....	1.4	1.0	0.9	0.9	1.0	1.0	0.9	0.9	1.0
Switzerland.....	277	313	421	341	329	284	274	251	311
Sweden.....	186	228	211	281	221	193	221	186	216
Holland.....	106	127	149	174	184	197	181	192	164
Austria.....	128	130	156	143	138	127	102	105	129
Italy.....	112	148	142	109	110	98	83	88	111
Australia.....	123	111	96	69	90	84	70	44	86
Japan.....	77	81	76	76	57	73	51	68	70
Scotland.....	59	89	75	95	75	70	56	41	70
Belgium.....	68	96	92	60	49	55	56	54	66
Czechoslovakia.....	51	52	55	54	40	43	49	46	49
Norway.....	46	57	52	51	28	35	37	24	41
Denmark.....	47	44	32	49	39	29	38	30	39
Hungary.....		58	45	51	43	38	27	28	36

OTHER COUNTRIES

Average per year for period 1930-37

Argentina.....	29.5	China.....	3.1
Spain.....	29.1	Danzig.....	2.0
New Zealand.....	27.8	Colombia.....	1.0
Mexico.....	24.9	Dutch East Indies.....	1.9
Cuba.....	20.4	Luxemburg.....	1.8
Africa (Un. South Africa).....	19.6	Honduras.....	1.5
Poland.....	13.0	Latvia.....	1.5
Wales.....	11.0	Peru.....	1.5
Ireland.....	10.6	Yugoslavia.....	1.4
Russia.....	7.4	Uruguay.....	1.4
Brazil.....	6.3	Newfoundland.....	1.3
Finland.....	6.3	Palestine.....	1.1
India.....	5.8	Algeria.....	1.1
Roumania.....	4.9	Dominican Republic.....	1.0
Chile.....	4.6	Estonia.....	1.0
Venezuela.....	3.6	Monaco.....	1.0

Other countries, not listed, average less than one per year.

NOTE.—All figures include design patents, but not reissues. Percentages are based on patents granted in the United States to both residents and nonresidents.

EXHIBIT No. 211

[Source: Prepared by Staff of U. S. Patent Office]

Number and proportion of patents granted by some foreign countries to citizens or residents of the United States

	1930	1931	1932	1933	1934	1935	1936	1937	Average
Canada.....	7,298	7,465	6,826	5,998	5,624	5,010	5,709	5,354	6,161
%.....	64.8	67.1	66.6	65.7	64.4	64.3	69.8	69.4	68.5
England.....	3,376	2,969	2,524	2,305	2,353	2,582			2,685
%.....	16.1	15.6	14.1	13.3	13.2	14.5			14.6
France.....	2,291	2,004	1,516	1,237	1,221	1,297	1,273	1,482	1,540
%.....	9.5	8.4	7.0	6.2	6.4	7.2	7.6	8.8	7.7
Germany.....	1,815	1,870	1,928	1,512	1,021	954	941	785	1,355
%.....	6.7	7.2	7.4	7.0	6.0	5.9	5.6	5.4	6.6
Italy.....	1,106	1,146	1,265	694	741	750	894	727	915
%.....	10.2	10.5	10.3	7.4	7.4	7.5	7.5	7.3	8.6
Japan.....	465	336	392	344	205	219	191		307
%.....	9.3	7.8	8.0	6.3	4.4	4.6	3.9		6.5
Czechoslovakia.....	272	310	340	317	282	256	279	239	287
%.....	7.4	8.5	8.7	7.9	7.6	8.0	7.6	7.7	7.9
Switzerland.....	368	351	271	200	261	227	238		274
%.....	5.1	4.8	3.6	2.8	3.3	3.0	3.5		3.7
Holland.....	216	241	281	264	238	233			245
%.....	9.2	9.8	10.2	8.7	8.9	8.3			9.2
Norway.....	227	176	294	163	127	93	111	102	162
%.....	15.3	15.2	15.2	11.0	9.4	7.4	7.9	7.6	11.3
Denmark.....	221	156	165	108	105	91	87	102	129
%.....	10.3	10.4	9.9	7.2	7.1	7.0	6.1	6.3	8.1

*Patents granted in Canada to residents of the United States, divided by total patents granted in Canada, expressed in per cent.

EXHIBIT No. 212

[Source: Prepared by Staff of U. S. Patent Office]

Comparison of patents granted to residents of the United States by other countries with patents granted by the United States to residents of other countries

	Patents granted in country indicated to residents of the United States	Patents granted by United States to residents of country indicated	Difference
Canada.....	6,161	493	+5,668
England.....	2,685	1,273	+1,412
France.....	1,540	632	+908
Italy.....	915	111	+804
Czechoslovakia.....	287	49	+238
Japan.....	307	70	+237
Norway.....	162	41	+121
Denmark.....	129	39	+90
Holland.....	245	164	+81
Switzerland.....	274	311	-37
Germany.....	1,355	2,375	-1,020

*Figures are annual averages for 1930-37 as shown on preceding tables.

EXHIBIT No. 213

[Source: Prepared by Staff of U. S. Patent Office.]

Patents granted by various countries showing proportion granted to foreigners

	Annual number of patents granted	Number granted to foreigners	Percent granted to foreigners
United States.....	48,697	6,421	13.2
Germany.....	20,621	5,327	25.8
France.....	20,025	9,994	49.9
Great Britain (1930-35).....	18,417	9,522	51.7
Italy.....	10,634	6,782	63.8
Canada.....	9,269	8,368	90.3
Belgium.....	7,315		
Switzerland (1930-36).....	7,307	4,066	55.6
Japan (1930-36).....	4,845	1,165	24.0
Austria.....	4,475		
Czechoslovakia.....	3,613	2,749	76.1
Sweden.....	2,840		
Holland (1930-35).....	2,674	2,164	80.9
Australia.....	2,460		
Hungary.....	2,334		
Poland.....	1,845		
Denmark.....	1,590	1,056	66.4
Norway.....	1,428	1,031	72.2
Roumania.....	1,078		

Numbers are averages for eight years 1930-37 unless otherwise indicated.

EXHIBIT No. 214

[Source: Submitted by Clarence C. Carlton, Vice President, Motor Wheel Corp.]

SEPTEMBER 30, 1938.

PARTS OF AN AUTOMOBILE (EXCLUDING THE BODY PROPER) AND AUTOMOTIVE EQUIPMENT

A. Chassis and actuating mechanism.

1. Frame, including torque members and other parts used to promote rigidity.
 - a. Radius rods and attaching parts.
 - b. Torque tube.
 - c. Torque arm.
2. Springs and parts thereof including attaching parts.
3. Shock absorbers and parts thereof including attaching parts.
4. Axles.
 - a. Front axle and parts thereof.
 1. Spring seats with connecting and attaching parts.
 - b. Rear Axle, housing and actuating mechanism.
 1. Axle shaft.
 2. Axle tubing.
 3. Axle housing.
 4. Axle shaft bearings.
 5. Spring perch.
5. Wheels and associated parts, and parts thereof and attaching parts including:
 - a. Rims.
 - b. Hubs, hub flanges, hub caps.
 - c. Drums.
 - d. Lugs and other securing parts.
6. Steering Mechanism, housing, and parts thereof.
 - a. Steering wheel with connecting and attaching parts.
 - b. Steering shaft.
 - c. Gear system and parts thereof including attaching parts and housings.
 - d. Drag link and attaching parts.

- e. Steering knuckle, tie-rod and attaching parts.
- f. Steering balls.
- g. Steering knuckle arms and attaching parts.
- h. Steering knuckles.
- i. King pins and king-pin bushings and shims and attaching parts.
- j. Steering spindle.
- 7. Motor and parts thereof including actuating mechanisms.
 - a. Cylinder head and attaching and connecting parts including:
 - 1. Water outlet manifold.
 - 2. Compression cocks or priming cups.
 - b. Cylinder block.
 - 1. Pistons and parts thereof.
 - 2. Piston pins.
 - 3. Connecting rods and connecting and attaching parts thereof.
 - 4. Piston rings.
 - 5. Cylinder studs.
 - 6. Cam shaft and parts thereof, including the actuating mechanism.
 - a. Cams
 - b. Bushings.
 - c. Timing gears, including idling gear and connecting and attaching parts thereof.
 - d. Timing chain cover and oil seal.
 - 7. Distributor drive shaft, gears, bushings, and their connecting and attaching parts.
 - 8. Tappets (or plungers).
 - 9. Valves, valve parts and their actuating mechanisms.
 - a. Valve springs.
 - b. Valve spring retainer locks.
 - c. Valve rockers.
 - d. Valve rocker arms.
 - e. Valve rocker-arm shafts.
 - f. Valve push rods.
 - g. Valve-stem guides.
 - h. Valve lifters or plungers.
 - i. Valve lifter guide bushing.
 - j. Valve lifter guide clamps.
 - k. Valve housing covers.
 - l. Valve adjusting nuts and locks.
 - m. Valve shims.
 - n. Valve sleeves, connecting rods, and connecting and attaching parts.
 - o. Valve junk rings.
 - 10. Air pumps.
 - 11. Gasoline power-pressure pump eccentric
 - 12. Gasoline power-pressure pump eccentric locks.
 - 13. Motor-generator sprocket eccentric.
 - 14. Motor-generator sprocket eccentric coupling.
 - 15. Cylinder water-jacket plate.
 - 16. Fan and parts thereof, including connecting and attaching parts.
- c. Crank case and enclosed parts.
 - 1. Crank shaft.
 - 2. Crank shaft bushings.
 - 3. Crank shaft shims.
 - 4. Bearings (main bearings).
 - 5. Sprocket.
 - 6. Crank shaft gear.
 - 7. Oil pan.
 - 8. Oil level indicator.
 - 9. Fly wheel with connecting parts.

8. Fuel system and parts thereof including the actuating mechanisms.
 - a. Gas tank and parts thereof, including connecting and attaching parts.
 - b. Auxiliary gas tank.
 - c. Fuel pipe and inter-connecting and attaching parts.
 - d. Check valves.
 - e. Vacuum tank and parts thereof, including attaching parts.
 - f. Air filter and parts thereof, including attaching parts.
 - g. Carburetor and parts thereof.
 - h. Carburetor heater and parts thereof.
 - i. Supercharger and parts thereof.
 - j. Intake pipe or manifold and parts thereof, including connecting and attaching parts.
 - k. Pressure pump and parts thereof.
 1. Exhaust pressure intake pipe and connecting parts.
 - m. Gasoline power-pressure pump and parts thereof.
 - n. Gasoline strainer assembly and attaching parts.
 - o. Gasoline filter and parts thereof.
9. Motor exhaust system and the parts thereof:
 - a. Manifold and connecting and attaching parts.
 - b. Exhaust pipe.
 - c. Muffler and parts thereof with connecting and attaching parts.
10. Ignition system and the parts thereof, except batteries:
 - a. Ignition switch.
 - b. Generator and parts thereof with connecting and attaching parts and including actuating mechanism:
 1. Motor generator.
 2. Generator drive sprocket.
 3. Generator drive chain.
 4. Generator drive shaft.
 - c. Magneto and parts thereof including connecting and attaching parts.
 - d. Distributor and parts thereof including connecting and attaching parts.
 - e. Spark Plugs and parts thereof.
 - f. Ignition wiring harness.
 - g. Ignition coil.
 - h. Relay or cut-out.
 - i. Fuse.
 - j. Automatic spark control system.
11. Cooling system and parts thereof, except rubber hose connections:
 - a. Radiator and parts thereof, with their connecting and attaching parts and including:
 1. Tanks—upper and lower.
 2. Radiator core.
 3. Radiator shell.
 4. Radiator grill.
 5. Cocks.
 6. Overflow pipe.
 - b. Circulating pump and parts thereof, including connecting and attaching parts and actuating mechanism:
 1. Drive shaft and connecting parts.
 2. Thermostat and parts thereof.
12. Clutch mechanism and parts thereof, including mainly the:
 - a. Clutch cover.
 - b. Actuating mechanism for cone clutch:
 1. Clutch cone and connecting parts.
 2. Clutch facings.
 3. Clutch shaft.
 4. Clutch disengaging pedal.
 5. Clutch disengaging rods.
 6. Clutch spring.
 7. Clutch bearings.
 8. Clutch shifter yoke.
 9. Clutch release sleeve.

- c. Actuating mechanism for disc clutch:
 - 1. Clutch rings.
 - 2. Clutch discs.
 - 3. Clutch flange.
 - 4. Clutch studs.
- d. Actuating mechanism for single plate clutch and parts thereof.
- 13. Transmission housing and the parts thereof, with the actuating mechanism included:
 - a. Gear box.
 - b. Gears (sliding) and dogs.
 - c. Shafts.
 - 1. As primary or main.
 - 2. Secondary.
 - d. Bearings.
 - e. Shift lever.
 - f. Shift rods.
 - g. Shifter cocks.
 - h. Shifter shaft.
 - i. Ball crank.
 - j. Speedometer drive.
 - k. Ford model T transmission and parts thereof.
- 14. Drive shaft with interconnecting and attaching parts thereof:
 - a. Universal joints and parts thereof.
 - b. Shaft bushing and parts.
- 15. Differential and parts thereof, including the actuating mechanism.
 - a. Sleeve lock.
 - b. Pinion bearing.
 - c. Pinion-bearing sleeve.
 - d. Driving pinion.
 - e. Differential ring gear.
 - f. Differential bearings.
 - g. Differential rollers.
 - h. Bearing adjusting nut.
 - i. Universal-joint flange.
 - j. Differential case.
 - k. Differential case cover.
- 16. Brake system and parts thereof, with the actuating mechanism.
 - a. Foot and hand-brake levers and attaching parts.
 - b. Brake shaft.
 - c. Brake pull rods.
 - d. Adjusting turnbuckle.
 - e. Equalizers.
 - f. Brake expander and actuating mechanism.
 - g. Brake shoes.
 - h. Brake shoe springs.
 - i. Bands.
 - j. Band lever.
 - k. Band lever springs.
 - l. Brake cam shaft.
 - m. Brake cam-shaft lever.
 - n. Brake-adjusting cam.
 - o. Brake-shoe anchor pin.
 - p. Brake toggle joints.
 - q. Hydraulic system.
 - 1. Actuating cylinder.
 - 2. Piston and actuating mechanism.
 - 3. Tubes.
 - 4. Reserve tanks for fluid.
- 17. Lubrication system and parts thereof.
 - a. Oil pump and parts thereof, including connecting and attaching parts.
 - b. Oil suction bell.
 - c. Oil-pump suction pipe and attaching parts.
 - d. Filler and level plugs and cocks and parts thereof.
 - e. Grease cup.

- f. High-pressure systems.
 - 1. Individual fittings and parts thereof.
 - 2. Central shot system and parts thereof, including connecting and attaching parts.
- 18. Small attaching and connecting parts.
 - a. Shims.
 - b. Gaskets.
- 19. Hood, fenders, running boards, cowlings, and connecting and attaching parts thereof.
- B. Electrical Equipment.
 - 1. Starting System and parts thereof with the actuating mechanism.
 - a. Starter Motor.
 - b. Starter wiring harnesses.
 - c. Starting Motor drive assembly, including connecting and attaching parts thereof.
 - d. Switches, including automatic starting switch.
 - e. Starting pedal rods and interconnecting and attaching parts.
 - f. Gear reduction system.
 - 2. Signal devices and parts thereof, including the actuating mechanism.
 - a. Buttons and switches.
 - b. Horns and buzzers and parts thereof, including connecting and attaching parts and wire harnesses.
 - c. Directional signals.
 - 3. Lighting system and parts thereof, including switches and wire harnesses.
 - a. Lamps and posts thereof, and posts except bulbs.
 - b. Resistance coils and parts thereof.
 - c. Switches and parts thereof, including connecting and attaching parts.
 - d. Wire harnesses and connections.
 - 4. Electrical gauges and control equipment and parts thereof.
 - a. Gasoline gauges.
 - b. Heat indicator.
 - c. Ammeter.
 - d. Other miscellaneous electrical gauges.
 - 5. Windshield wiper.
 - 6. Electrical fuel pump.
 - 7. Electrical defrosters.
 - 8. Cigarette Lighter.
 - 9. Electric clock.
- C. Mechanical Equipment.
 - 1. Gauges, hydraulic or otherwise, including instrument panel with its connecting and attaching parts.
 - a. Gas-tank gauge with its actuating mechanism.
 - b. Gas-pressure gauge and assembly.
 - c. Water-temperature gauges.
 - d. Oil-circulation indicator.
 - e. Oil-pressure indicator.
 - f. Other miscellaneous gauges.
 - 2. Control equipment and parts thereof.
 - a. Acceleration mechanism.
 - 1. Throttle lever and rods and accelerator pedal and parts thereof.
 - 2. Rods, springs, brackets, and connecting and attaching parts.
 - b. Choker rod with attaching and connecting parts.
 - c. Governors and parts thereof, with the actuating mechanism, and including the attaching parts.
 - d. Radiator shutter—(1) Hand controlled or (2) Thermostatically controlled and the actuating mechanisms.
 - e. Windshield-wiper control and attaching parts.
 - f. Carburetor heat control and parts thereof.

3. Speedometers and parts thereof:
 - a. Shafts and housings and connecting and attaching parts.
 - b. Actuating gear mechanism with connecting and attaching parts.
 - c. Speedometer head and the parts thereof.
4. Windshield wipers and parts thereof, including the attaching parts.
5. Emergency Service Tools.
- D. Accessories and parts thereof:
 1. Car heaters and parts thereof, including the connecting and attaching parts.
 - a. Water heaters.
 - b. Steam heaters.
 - c. Hot air heaters.
 - d. Electric heaters.
 2. Bumpers and bumper stops and connecting and attaching parts.
 3. Trunks and luggage carriers and parts thereof including connecting and attaching parts.
 4. Rear view mirrors and parts thereof.
 5. Tire chains.
 6. Miscellaneous Accessories:
 - a. Antishimmy equipment.
 - b. Antirattle equipment.
 - c. Accelerator pedals.
 - d. Radiator ornaments.
 - e. Running board plates.
 - f. Running board moulding.
 - g. Windshield and air vent screens.
 - h. Spare tire locks.
 - i. Splash guards.
 - j. Traffic signal finders.
 - k. Windshield wings.
 - l. License plate frame.
- E. Body fittings and attachments:
 1. Wind lace or weather strip
 2. Robe rails.
 3. Channel lace.
 4. Curtain cords.
 5. Assist cords.
 6. Cowl boards.
 7. Sun visors and the parts thereof.
 8. Body hardware.
 9. Body upholstery springs.
 10. Floor boards.
 11. Foot rail.
 12. Auxiliary seats.
 13. Ash receivers.

SUPPLEMENTAL DATA

BRIEF BIBLIOGRAPHY ON SHORT-TERM, MINOR, OR PETTY PATENTS [GEBRAUCHSMUSTER]

Oscar Zeller, *Das Gebrauchsmusterrecht*. Berlin, 1936, 562 pages.

German legal text on minor or petty patents.

Emerson Stringham, *Patents and Gebrauchsmuster in International Law*. Washington, 1935, 538 pages.

Two chapters of this book discuss the German law on petty patents.

Great Britain, Board of Trade. Report of the Departmental Committee on the Patents and Designs Acts and Practice of the Patent Office. Presented by the President of the Board of Trade to Parliament by command of His Majesty, March 1931, 104 pages.

Report of the Committee which revised the British patent law. Pages 81 to 86 contain the consideration of the proposal to introduce minor or petty patents, as a second class of patents. The proposal was rejected.

W. S. Bleistein, The German Law on "Gebrauchsmuster." Journal of the Patent Office Society, February 1937, Volume 19, Pages 126 to 135.

Description of the German law on the subject; includes changes introduced by the statute of May 5, 1936.

G. Benjamin, Double Protection by Gebrauchsmuster. Journal of the Patent Office Society, December 1936, Volume 18, Pages 884 to 886.

Note on a scheme practiced to prolong the monopoly of a petty patent under the German law.

H. Schmidt, "40 Years D. R. G. M." Journal of the Patent Office Society, January 1932, Volume 14, Pages 22 to 24.

Descriptive note of the German "petty patent" law.

E. Stringham, Gebrauchsmuster are Patents. Journal of the Patent Office Society, January 1931, Volume 13, Pages 26 to 30.

Note on the legal position of German "petty patents" as patents.

F. Herzfeld and F. Hoffmann, German Patent and German D. R. G. M. Journal of the Patent Office Society, March 1928, Volume 10, Pages 199 to 205.

Comparison of German petty patents with German major patents.

The following letter was entered in the record on February 8, 1939 and is printed herewith in connection with Dr Jewett's testimony. See text pp. 963, 968, 969, 971 and 976.

EXHIBIT No. 244

F. B. JEWETT, Vice President

AMERICAN TELEPHONE AND TELEGRAPH COMPANY

195 BROADWAY, NEW YORK

Exchange 3-6000

JANUARY 24, 1939.

HON. JOSEPH C. O'MAHONEY,

Chairman, Temporary National Economic Committee,

United States Senate, Washington, D. C.

MY DEAR SENATOR: The purpose of this letter is to answer the two inquiries which were left with me the other day when I testified before your Committee; and also to submit for the record a few additional paragraphs discussing the long-life vacuum tube.

At the outset, I should like to point out that in speaking from memory I inadvertently misstated the number of patents and inventions which the Bell System owns. The number (15,000) which I gave is the total number which we were free to use as of 1934. The number owned as of that date was about 9,500—and naturally this is a number which varies from month to month because of new and expiring patents. As to the others, we held licenses to make and use.

The first inquiry (by the Chairman) was:

Do your cross-licensing agreements prevent you from making the 50,000-hour tube for the radio field?

The answer is that they do not. Our cross-license agreements do not prevent us from using any of our own inventions for any purpose whatever. Moreover, by those agreements we also gave to the General Electric Company, the Westinghouse Company and the Radio Corporation the right to use our inventions for the manufacture and sale of tubes for radio receiving sets as well as many other purposes. Those agreements, while leaving us free ourselves to license others for the purpose, also gave to those companies the right to license others under our inventions for receiving set tubes. Under the cross-license agreements, we ourselves are free to use the inventions of the three companies named in the manufacture of radio receiving set tubes—royalty-free for the first \$1,000,000 worth, and on a royalty basis thereafter up to the amount of \$2,000,000 worth. Actually we have not gone into the home receiving set or receiving tube business and only in other receiver business to a most limited extent. The Radio Cor-

poration has, I understand, licensed some dozen or fifteen other manufacturers to make radio tubes, under both its own and our inventions.

The second inquiry (by Judge Davis) was:

Does the Western Electric Company make available to independent telephone companies the long-life tubes used in your plant?

The answer is that it does. For many years repeaters and one and three-channel carrier equipment utilizing such tubes have been available to independent connecting companies by lease from the Bell Associated Companies and, more recently, these equipments have been available by sale from the Western Electric Company. The quality of the tubes involved is the same as the tubes in our own plant. The actual release to the Western Electric Company under American Telephone and Telegraph Company patents is to sell to connecting telephone companies, railroads, power, oil and pipe line companies. We have never, so far as I know, declined a request for any such equipment from any independent telephone company.

The foregoing gives the information which I promised the Committee I would supply to it. In addition, I should like to offer for the Committee's record the following few supplemental comments regarding the long-life vacuum tube. I suggest this because I believe that the record in its present form can be construed as a criticism of the radio industry—in fact, certain newspaper reports based upon my testimony have already implied as much.

I should like to point out that the problem of designing vacuum tubes for use in telephone repeaters differs in important fundamental respects from the problem of designing tubes for radio-receiving sets. My regret, of course, is that I did not take time while testifying to make this perfectly clear, particularly as a very few words would have been sufficient to establish the fact. Although the radio tubes of the present day may be of considerably shorter life than our telephone repeater tubes, it does not follow that the radio tubes would be better suited to their work if they partook more of the character of telephone tubes. In the first place, the average radio set is itself a thing of relatively short life, perhaps four to six years, so that little or nothing would be gained by using in this set tubes whose normal life is eight to ten times the life of their associated equipment. Particularly would this be true if the longer-life tube represented any material increase in tube cost. In the present state of our knowledge, such longer life would definitely entail a greater cost.

In the case of the telephone repeater the more expensive type of tube is amply justified, but for reasons which do not operate in the case of radio-receiving sets. In the first place, the telephone repeater forms part of a relatively expensive circuit connecting distant points. Because of this and within wide limits, the first cost of the telephone tubes is a very small quantity compared to the cost of the circuit of which they are a part. The cost of tube operation, however, is a most important consideration in the design of the telephone tube. Repeater tubes must operate uniformly and reliably twenty-four hours a day every day in the year and they have to be fed from storage batteries, a form of electrical energy costing several times as much per unit as lighting current. Hence, low current consumption in the telephone tube is essential; and it happens that we have been able to make long tube life a concomitant of low energy consumption.

These exacting operating and service considerations do not obtain, apparently, in the design and manufacture of receiving set tubes. In the latter case the manufacturer is concerned with tubes of high quality, low initial cost, and life characteristics compatible with the life of the sets they serve. I believe that these requirements have been well met by the industry.

In conclusion, let me point out again that to the extent that the long-life telephone tube is covered by patents, these are available to radio manufacturers through license. The engineering problem of the radio designer, however, has diverged from that of the telephone designer, with the result that each has developed a tube construction best suited to his industry.

Trusting that it will be possible to incorporate this brief statement as a part of the Committee's record, I am.

Yours very truly,

F. B. JEWETT, *Vice President.*

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